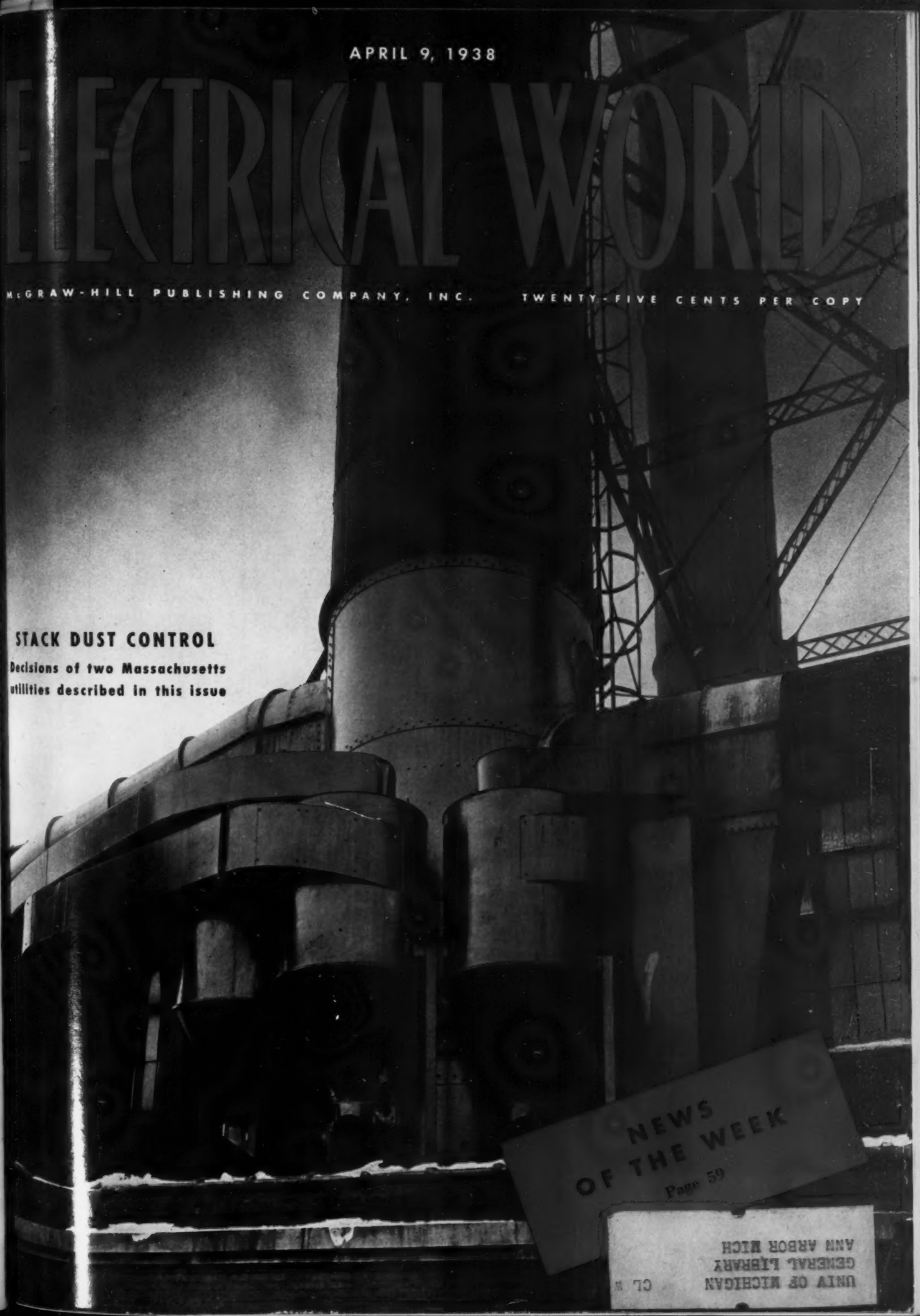
APRIL 9, 1938

ELECTRICAL WORLD

McGRAW-HILL PUBLISHING COMPANY, INC. TWENTY-FIVE CENTS PER COPY



STACK DUST CONTROL

Decisions of two Massachusetts utilities described in this issue

NEWS OF THE WEEK

Page 59

UNIV OF MICHIGAN
GENERAL LIBRARY
ANN ARBOR MICH
CL

Surety

At the Nerve-Center of Power Distribution

WESTON

Switchboard Instruments

There's an extra increment of surety and mental confidence at the nerve-center of power distribution when the switchboard is WESTON equipped. For behind each WESTON Instrument is a tradition of truthful measurement that has its origin in a 50-year quest for increasingly higher standards of dependability in service.

For small control panels, or for "showroom" switchboards of mighty power plants, there are WESTON Instruments of the type, size and range required . . . instruments reflecting in their outward appearance the inward qualities that have made the name WESTON the international synonym for dependable electrical measurement.

Why not have complete specifications on all these instruments available? Write for catalog to... Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark, New Jersey.

ELECTRICAL WORLD

APRIL 9, 1938

Needed—A Catalyst

"On account of the fact that in the past the utilities have collected from the public the major part of the money which goes to the manufacturers for equipment, we have been inclined, perhaps, to assume a somewhat lofty air with respect to the manufacturers, an attitude which is not justified by the basic facts. We should never forget that the quality and attractiveness of the service we have to sell depends upon the design and efficiency of the equipment necessary for the generation, distribution and consumption of that service. We crow gently over the fact that today a pound of coal can be made to produce five or six times as many kilowatt-hours as a generation ago, without perhaps remembering that this is an achievement of the manufacturers rather than of ourselves. Even in our sales efforts our accomplishments have been made possible largely by the ingenuity and skill of the manufacturers in their design and production of apparatus which can make the use of electricity economical and convenient to the average citizen."

This straightforward avowal of the dependence of the utility industry upon the manufacturers, made by President C. W. Kellogg of the Edison Electric Institute before the annual sales conference last week, is something that has been needed to be said for some time. It furnishes the background against which utility and manufacturer can work together as elements of the same industry rather than just as buyer and seller.

The electrical industry in the past has done too much fighting within its own ranks. This fighting has resulted most often from selfishness—a lack of consideration not only of the interests of the other branches of the industry, but also of what the other fellows could and did contribute to the welfare of the industry. Fortunately, during the past ten years many of the causes of battle have been removed and a better spirit is manifest throughout the entire industry. But there is room for improvement.

The electrical industry needs a catalyst—something that will emphasize the mutuality of interest not only between the utilities and manufacturers but between all branches of the industry. In several localities this is supplied by an electrical league, many of which are doing an exceptionally fine job. There is nothing national, however, nor has there been since the Society for Electrical Development closed its doors.

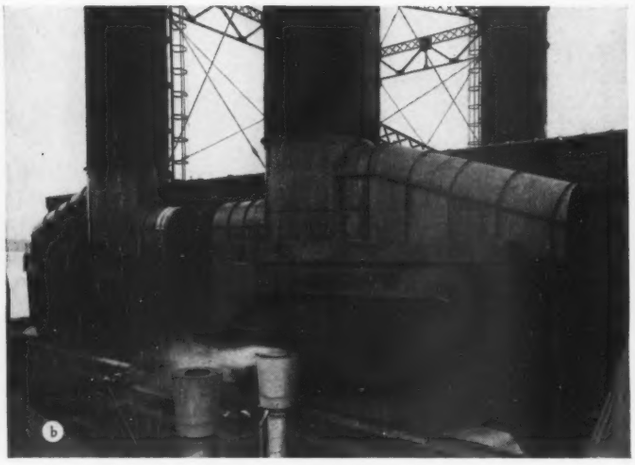
Other industries made up of several branches have a catalyst. They have something that brings them all together and emphasizes their common purpose. The automobile show, for instance, does it for the automotive industry. In other industries the annual conventions are held jointly. We in the electrical industry, however, continue to go our separate ways alone, which gives emphasis to the fact that group interests are different rather than mutual.

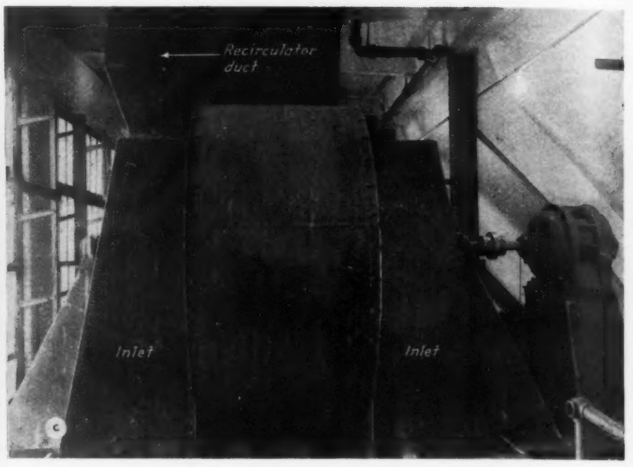
The day of the rugged individualist, whether it be in society or in business, is passing. Collective effort is rapidly taking its place. Organization of people and businesses having common interests are more and more necessary. Individuals cannot fight organized movements.

The electrical industry is making real progress in market development through co-operative campaigns. This alone has done much to bring the manufacturers and utilities closer together. It has been a recognition of the part each had to play to build a market, and the results have opened the eyes of other elements of the industry to co-ordinated co-operative effort.

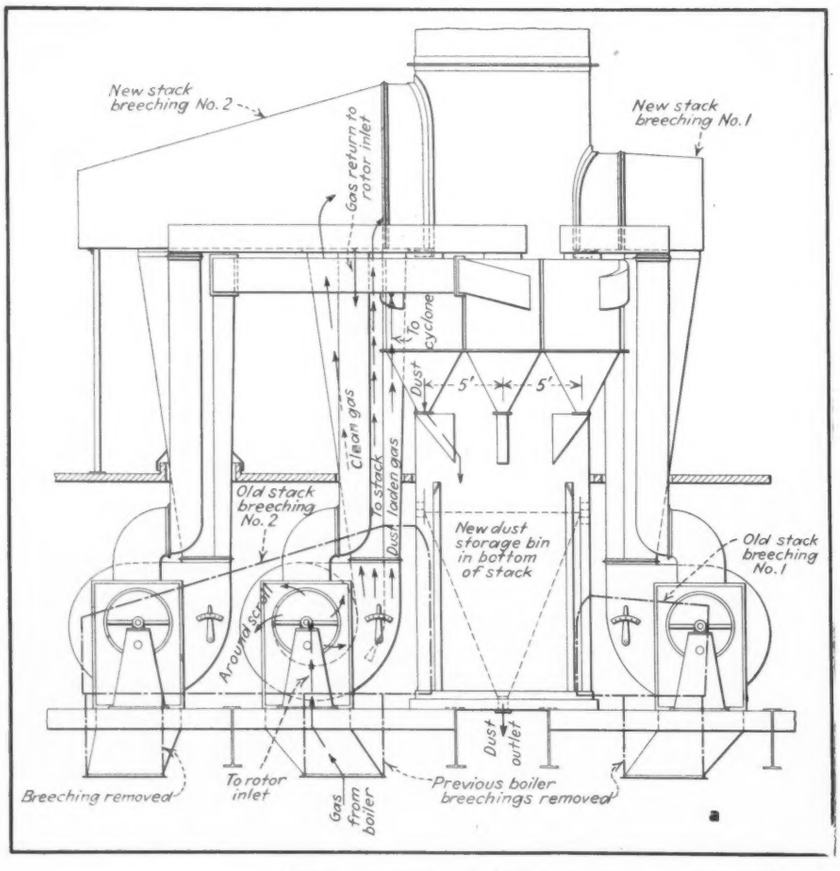
While trade relations within the industry were never better than they are today, we need a catalyst that will bring out the essential strength of every branch of the industry and point it all in one direction for co-ordinated development of the electrical market. We must have confidence, we must have respect, we must acknowledge our mutuality of interest if we are to succeed as an industry.

Bay State Plants Attack





The gases leaving the boiler enter at each end of the fan wheel and the cinders are thrown by centrifugal force to the outer stratum of gas around the fan scroll. This outer stratum, containing the cinders, is then led by means of an adjustable skimmer damper through a suitable flue to the cyclone, where the cinders are precipitated and led to the storage bin in the base of the stack. The cinder-free gases in the fan scroll are passed direct to the stack. The gases which were led to the cyclone are then again returned to the inlet side of the fan wheel, together with any unseparated cinders. The amount of gas bypassed is controlled by the position of the skimmer damper and varies from 10 to 20 per cent, depending upon load conditions.



Fan wheels are of double width and double inlet construction so designed that if erosion from the cinders becomes apparent on the fans Thermix-patented removable wearing blades may be applied. Fan bearings are air-cooled SKF heavy-duty ball type. Both fan scroll and cyclone are built of 3/16-in. steel plate equipped with removable steel plate liners. Each fan is served with a 50-hp. General Electric, two-phase, 440-volt, constant-speed motor, 720 r.p.m., connected to the fan with a No. 3 Fast flexible coupling.

Fans are guaranteed to handle 120,000 lb. of gas per hour at a temperature of 750 deg. F., with a guaranteed draft boost of 0.5 in. W.G. over the previous 0.75 in., with a guaranteed dust collection of 90 per cent analysis as follows:

Through 100 mesh, per cent..	50
Through 100 on 200 mesh, per cent	50

The only tests made to date are as follows:

With the boilers running at 200 per cent of rating and burning 4,257 lb. per hour, or approximately 45 lb. per square foot of grate, cinder elimination was 67 lb. per hour per boiler, or approximately 1.6 per cent of the coal as fired. Cinders are of a very fine structure; finer, in fact, than cinders formerly collected on the City Hall Esplanade and returned to the United as its property. This is probably due to the cinders breaking up while passing through the fan wheel and cyclone.

(a) Former breeching space under roof used for elimination equipment.

(b) Three cyclones are grouped around each stack. The lower horizontal duct leads to the cyclone and the cleaned gases return to the recirculator fan through the upper duct.

(c) Recirculator fans installed in narrow aisle formerly occupied by stack breeching shown before heat insulation was applied.

Dust removed and draft increased at Springfield's State Street plant

Chimney Discharge Problems

Cinder and Fly Ash Conditions Favorably Met at Springfield and Lynn by Wholly Different Methods of Removal

METHODS of improving operating conditions in connection with stack discharges at the steam generating plants of the United Electric Light Company, Springfield, Mass., and the Lynn Gas & Electric Company, in the same state, were subject to extensive discussion at a recent gathering of the New England System Operators Association in Boston. From comments of W. D. Packard, superintendent of generation, and I. A. Patten, general superintendent, of the former and latter utilities, the following résumé of the experience of these central stations is here presented.

The Springfield company's steam plant is located at the foot of State Street, in the heart of the city, and bordering the Connecticut River. The boiler plant was installed in 1917 and consists of twelve 700-hp. Edgemoor boilers equipped with seven-retort Taylor stokers and Foster superheaters. The boilers are served by four 11-ft. steel stacks 198 ft. high above the boiler room floor, three boilers being connected to each stack with non-symmetrical flue connections, two on each side and one opposite, located directly below the roof.

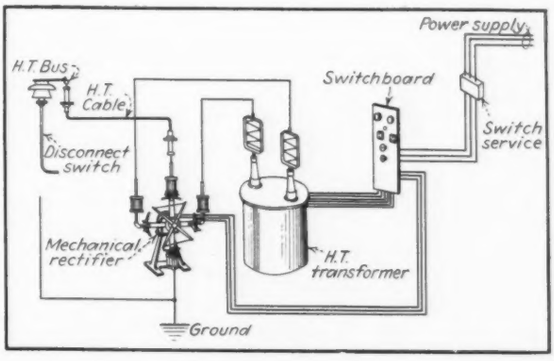
For some years the public had been increasingly conscious of cinder discharges in the heart of the city, which was concerned by heavy railroad switching movements and the operation of a gas plant within a fraction of a mile of Court Square, and adjacent to the United company's station. In 1929-30 the matter of cinder catchers was considered, but the only type which would then lend itself to installation at State Street was the mechanical baffle design. It was found that this would reduce the draft to a prohibitive degree. As loads were falling due to the depression, State Street was called upon to do less and less and eventually was shut down (April, 1932). Public smoke inspection was greatly curtailed owing to economic conditions; the railroad transferred its switching operations to the extreme north end of the city, and cinder agitation ceased with respect to the United company.

After the 1936 flood State Street was more or less in operation to dry out, and in July of that year the boiler plant was again placed in service at high rating. Complaints as to cinders were renewed, although the United company has never experienced any difficulty in keeping the plant within the city smoke ordinances while burning coal of 17 to 21 per cent volatile. In the fall of 1936 the company again started to investigate cinder-catching devices. It was evident from the first that a difficult problem must be solved on account of the limitations in space and the inability of the plant to sacrifice any loss in draft, which was only 0.75 in. at the boiler damper.

It was found that the only satisfactory type of equipment was a cinder trapping type of induced draft fan with some form of dust collector on an individual boiler unit basis. After a thorough study of different types and sizes of fans it was found possible to install twelve Thermix, type 4, recirculating dust-collecting fans, each to operate in conjunction with one 700-hp. boiler, locating these fans in the the space occupied by the existing flues, the fan discharge entering the stack about 19 ft. above the roof. These fans would also give an increase of 0.5 in. in draft over existing conditions at maximum ratings.

The dust collectors, three for each stack, could be grouped around the outside of the stack above the roof, and by placing a diaphragm in the stack directly under the new flue entrance the base of the stack could be used for a collected-dust bin. By installing a downtake pipe from the conical base of the bin trapped cinders could be led to the basement ash-handling equipment.

As this type of equipment ran into



Schematic diagrams of Cottrell electrical precipitation equipment

Lynn's precipitator tank differs from the one shown, but power supply scheme is the same. Precipitator power supply is 575 volts a.c., brought in through a service switch to the switchboard, then through a rheostat (not shown on the drawing) to the low-tension circuit of the transformer. The purpose of this rheostat is (1) to secure regulation of the high-tension voltage between taps, (2) to limit current flow at moments of arc-over of the high-tension circuit and (3) to reduce surges and make for smoother operation. The low-voltage winding of the transformer has five taps, giving a variation in the high tension voltage of from 55,000 to 75,000 volts in 5,000-volt steps. In the high-tension circuit, resistance rods are inserted at each pole of the rectifier to damper peak voltages and high-frequency oscillations.

The mechanical rectifier is one of the simplest methods of changing alternating currents to unidirectional current. The negative pole is connected through suitable high-tension cable to the discharge electrodes while the positive pole is grounded. The collecting electrode and precipitator shell are likewise grounded, thus completing the circuit. The schematic precipitator shell shown here is not at all similar to the one at Lynn. The mechanical rectifier is driven by a synchronous motor, and since this rectifier may fall in step with either alternation of the sine wave, some assurance must be had that the direction of flow of the unidirectional current is such that the discharge electrodes are always at negative polarity. This is accomplished by automatic polarity control.

quite a large sum of money, due to necessary changes in electrical equipment and building revisions, the question of burning oil was considered. It was found, owing to inability to place contracts, building revisions and changes in furnace design, storage facilities required, etc., that this would about equal the cost of cinder-catching equipment and might have a nuisance problem of its own. However, the management felt that something must be done in the interest of public relations even though State Street was not violating any city ordinances at the time.

All boilers equipped

It was first planned to equip only one stack with a trial installation of cinder-catching devices, but the more the conditions were studied the more convinced the management became that here was an excellent opportunity to increase capacity as well as to eliminate cinder emission.

In May, 1937, funds were appropriated for a complete installation of cinder-catching equipment for all boilers. A contract was given to the Prat-Daniel Corporation, Port Chester, N. Y., to furnish and erect twelve Thermix fans equipped with one cyclone per fan. Shipment began in August and the last of the twelve went into service in January, 1938. While these fans to date have not had any extended length of service, their performance gives every reason to believe that they will be highly satisfactory. The absence of small operating difficulties usually present in starting new equipment is very noticeable and every one connected with the problem seems very well satisfied.

This type of cinder-catching device was first developed in Europe in 1926 and the pioneer American installation was by the International Harvester Company in 1928. The principle involved is shown in an accompanying illustration.

Test results

A capacity test made on No. 6 boiler on January 7, said Mr. Packard, "showed that at 300 per cent rating with a tuyère pressure of 4.3 in. W.G. and with the boiler and stoker dampers wide open, we were still able to maintain a 0.023-in. W.G. pull over the fire, which would seem to indicate that the fans are of sufficient capacity and that we have very definitely improved draft conditions in the furnaces, all of which is most desirable from the point of operating as well as stoker maintenance. Undoubtedly some of this expense will be returned in additional capacity and lower costs of stoker maintenance.

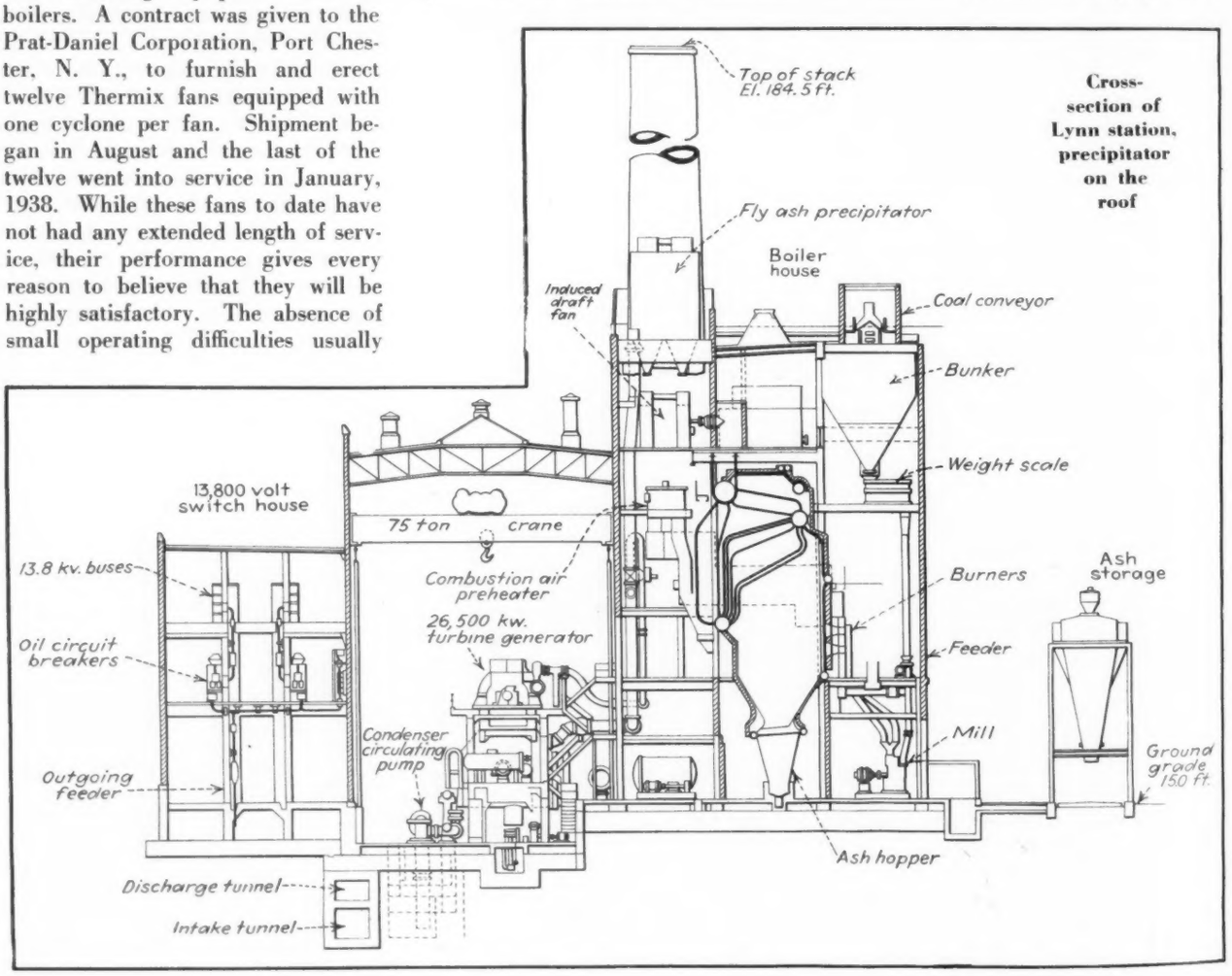
Analysis of cinders removed from bin:

	As Received	Dry Basis
Moisture, per cent.....	0.19	....
Volatile matter, per cent..	2.60	2.61
Fixed carbon, per cent....	55.00	55.10
Ash, per cent.....	42.21	42.29
Sulphur, per cent.....	0.60	0.61
British thermal units....	8,410	8,436

In conclusion, we do not anticipate any further complaints of cinder emission directed at this plant, but one of the satisfactions of this type of equipment is the possibility of taking the city smoke inspector down into the ash cellar any day after a full 24-hour run of the plant and show him approximately 16,000 lb. of cinders that did not go into the atmosphere over the city.

The figure of 16,000 lb. for a full day's run is based on preliminary tests and, coupled with a calorific value for the trapped cinders of 8,400 B.t.u. per pound, leads to the query, what shall be done with the cinders?

[*Continued on page 114*]



Cross-section of Lynn station, precipitator on the roof

Control of Radio Noise Can Enhance Appliance Load

By R. L. HASKINS . . . C. W. METCALF
Tobe Deutschman Corpoartion, Canton, Mass.

THE rate at which an electrical appliance consumes energy is not an index of its load-building value. Many types of household electrical conveniences impress upon the power distribution system radio noise voltage approaching the amplitude of available radio signal voltages, with the result that reception of radio broadcasts is rendered unsatisfactory and one or more radio receivers may be turned off when the appliance is turned on. Consequently, the real load value of an electrical appliance is not its rated wattage, but is the difference between the power consumed by the appliance and that which would have been consumed by the radio receivers whose operation the appliance prevents.

In many cases, as in an apartment building, the lost radio load may far exceed the added appliance load, in which case the load value of the appliance is negative. The extent to which this condition exists is indicated by reports of public utility interference investigators whose records show that small appliances used in the homes of radio listeners are responsible for a high percentage of the radio interference complaints they receive. For this reason, many utilities specify that the appliances they purchase for resale must be non-radio interfering.

Unfortunately, this specification has been so vague as to be subject to considerable latitude in interpretation by both the purchaser and the manufacturer of the appliance. Lack of standard procedure for radio noise measurement has been responsible for the inability of utilities to establish an engineering basis for their specifications with reference to radio interference. In fact, the wide variation in radio noise characteristics of appliances as indicated by tests conducted in different locations by means of ordinary household radio receivers has led many engineers to believe that radio noise is not susceptible of engineering analysis.

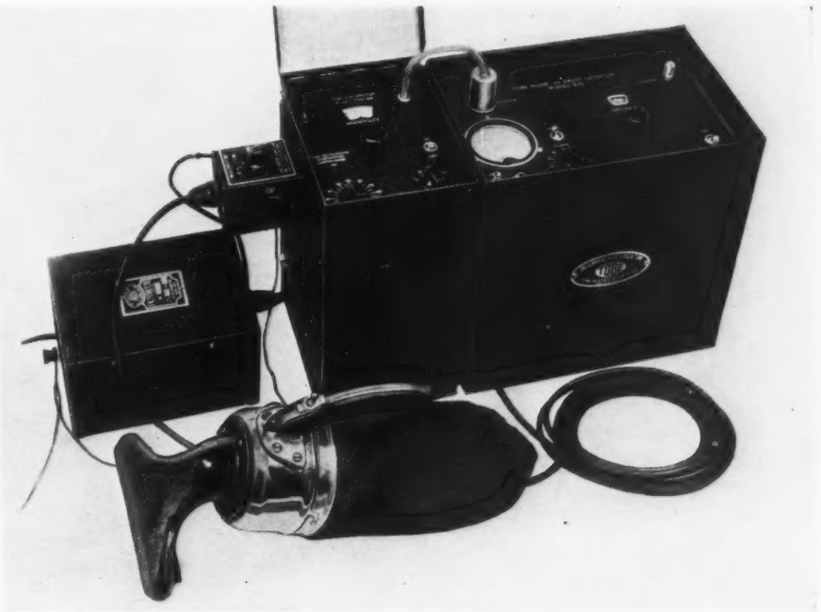


Fig. 1—Standard set-up for measuring radio noise created by electric appliances

Same equipment usable for measuring noise originating on line, in conjunction with coupler or exploring antenna.

Such analysis is possible by means of a standard procedure for measuring radio noise devised by the joint committee on radio coordination for E.E.I., N.E.M.A. and R.M.A. to provide a means of securing radio interference data with reasonable accuracy and assurance that measurements made at different times and in different locations will be comparable.

Two components of noise

The radio noise voltage developed by an electrical appliance consists of two components, either of which may adversely affect radio reception. First, there is the symmetrical noise voltage measurable across the power supply terminals of the appliance; second, there is the asymmetrical noise voltage measurable between the power supply lines and ground. The effect of these voltages on radio reception is determined by: (1) Their magnitude; (2) the susceptibility of the receiver and its antenna to pick up extraneous radio frequency voltages; (3) the characteristics of the electric wiring associated with both the receiver and the appliance; (4) the coupling factor between the building wiring and the receiver and its antenna; (5) the ratio between the radio noise voltage and the field intensities of desired signals from radio transmitters.

From these facts it is seen that the analysis of appliance interference

consists of two separate operations; first, measurement of radio noise voltage according to the standard test procedure, and, second, correlation of the data thus secured with data relating to the location in which the appliance is to be used. By such correlation the utility can safely establish an upper limit for the permissible noise voltage output of an appliance to be called interference-free.

Vacuum cleaner test

A typical application for radio noise analysis is the investigation of the radio interference characteristics of a small vacuum cleaner to be sold by the merchandising division of an electric power company. For purposes of illustration, it is assumed that the test is being conducted for a New England utility and that the characteristics of the building wiring circuits and of the receiver are average, which generally means bad from the standpoint of radio interference.

The object of the test is to determine whether the appliance as submitted by the manufacturer may be offered for sale by an electric power company without danger of causing radio interference complaints and lost radio load. The first test consists of the measurement of symmetrical or line-to-line radio noise voltage. A standard assembly of commercially available equipment conforming to the specifications of the joint radio co-ordination committee is illustrated in Fig. 1. Fig. 2 is a block diagram in which the units comprising the standard radio noise meter and its accessories are identified.

Quantitative measurement of radio noise voltage is secured by the comparison method. The amplitude of the radio noise carriers with their associated modulation is indicated by a meter in the output circuit of a standard test receiver including radio frequency amplification, rectification and audio-frequency amplification. Evaluation of the output meter indication in standard terms is secured by substituting for the device under test a radio frequency generator 50 per cent modulated at 400 cycles and by adjusting the attenuator associated with the calibrator until the same output meter indication is secured for the voltage delivered by both the calibrator and the device under test. The radio frequency voltage as read from the calibrated r.f. generator in microvolts is considered to be equal to the r.f. voltage output of the appliance for the radio frequency to which the radio noise meter is adjusted. To show the effect of appliance operation in any part of the broadcast band, readings are taken for various frequencies between 550 and 1,500 kilocycles. Curve A-A in Fig. 4 is plotted from line-to-line *noise voltage* readings and shows the variation in appliance interference output through the broadcast band.

Line-to-ground interference

After having determined the amplitude of symmetrical radio noise voltage, it is necessary also to measure the asymmetrical or line-to-ground interference voltage. By "ground" is meant both the frame of the appliance and the nearest electrical ground. As Fig. 3 shows, the same equipment as was used for measuring line-to-line noise voltage is employed in measuring line-to-ground voltages, with the exception that a different type of network is used for connecting the appliance to the noise meter.

The coupling network employed in measurement of asymmetrical

[*Continued on page 119*]

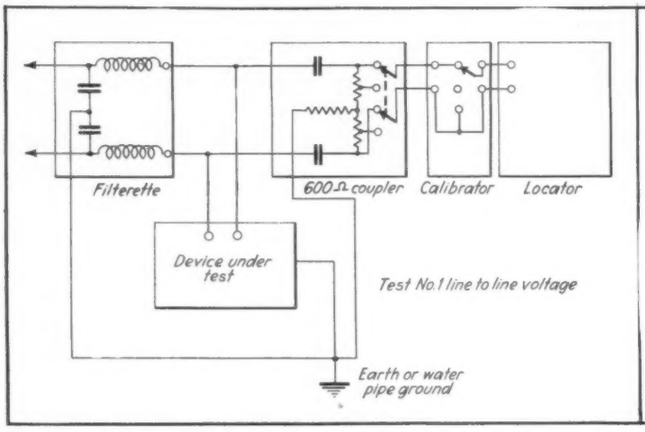


Fig. 2—Block diagram of calibrator set-up for line-to-line test

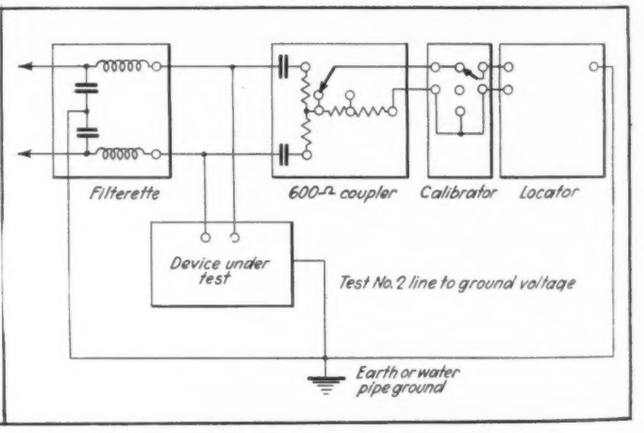


Fig. 3—Block diagram of calibrator set-up for line-to-ground test

Fig. 2—It will be noted that there is interposed between the power supply line and the test circuit a low pass filter. This filter has two essential functions: First, it keeps noise voltages present on the power circuit from reaching the test circuit and thus introducing error to the measurements; second, it effectively isolates the test circuit from changes in the radio frequency impedance of the power circuit. Since the impedance of a power supply line may vary from as low as 50 ohms to as high as several thousand ohms, it is obvious that the power line filter is essential to accurate measurement. The design of the power line filter is such that it presents to the measuring circuit an impedance of at least 6,000 ohms at any frequency between 550 and 1,500 kilocycles. This permits the coupling network, by means of which the radio noise meter is connected to the device under test, to be the only external factor affecting noise voltage output of the appliance, since the input circuit of the noise meter contains a 21-mmf. condenser which reduces the loading effect of the instrument to a negligible value. The impedance of the coupling network is 600 ohms, a value selected by the radio co-ordination committee as a fair average for the radio frequency impedance of home wiring. A feature of practical convenience, provided in the coupler, is the tap switch that allows either one-tenth or one-half the noise voltage to be impressed on the radio noise meter. The tap switch controls a balanced potentiometer type attenuator so that the impedance across the test circuit is independent of switch settings.

Fig. 3—In this test the appliance frame and the noise meter must be connected to an electrical ground. It is important that this specification be observed because although many appliances are not actually grounded when in use the greatest noise voltage is available when the appliance frame is grounded. An example of this effect is the increase in noise heard in a radio receiver when a small, ungrounded appliance is touched by its operator. This increase in noise is due to the fact that the appliance frame is placed nearer ground by the capacitance of the body of the person touching the appliance and thus the condition conducive to maximum noise voltage generation is produced. It is obvious that for maximum accuracy of asymmetrical noise voltage measurement the test circuit and appliance frame must be grounded.

Bushing Flashovers Reduced by Porcelain Umbrellas

By A. H. BEILER

American Gas & Electric Service Corporation, New York, N. Y.

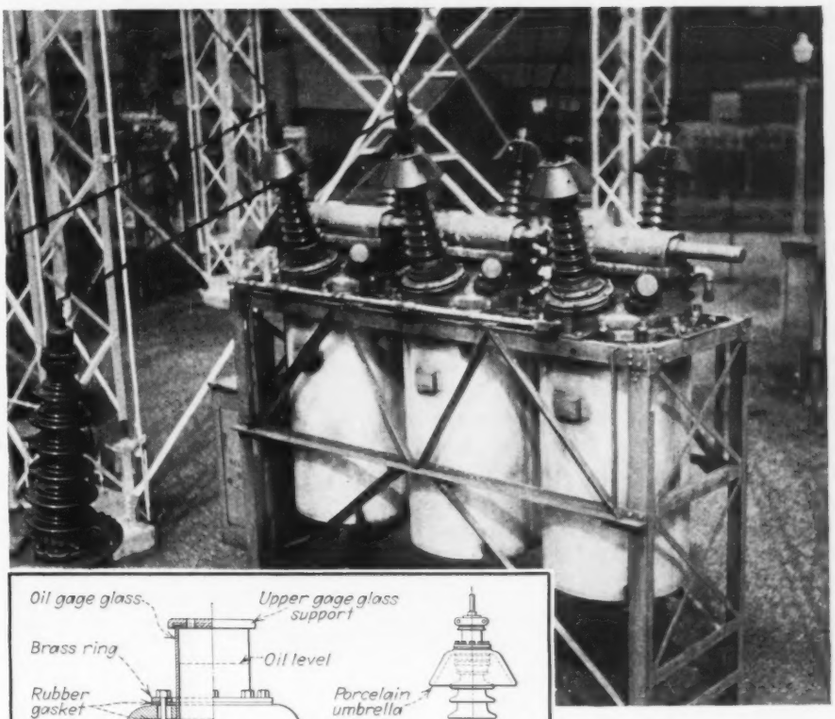
PORCELAIN umbrellas installed on oil circuit breaker bushings some three years ago have kept the tops of the bushings clean and flashover troubles caused by deposits have ceased. Now the bushings require only about one-fourth the attention they previously required under severe conditions of contamination.

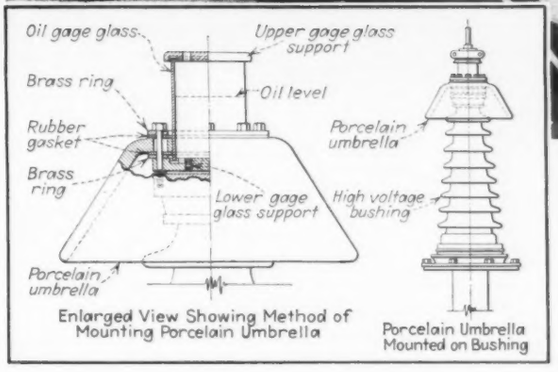
Where high-voltage equipment is situated near steel or cement mills, chemical plants or in other localities where there is an excessive amount of contamination in the air trouble is frequently experienced due to both surge and normal frequency flashover of the bushings on circuit breakers or transformers in outdoor substations. Several flashovers within a comparatively short time, and apparently due to this cause, occurred at a 73-kv. substation situated near a steel mill.

A careful analysis of the situation revealed that conducting dust particles in themselves were not particularly harmful if dry, but that a bushing coated with such dust presented a distinct hazard under certain conditions when wet. It was noted, for example, that flashovers, if they occurred at all, took place most often at the beginning of a rainstorm rather than after the bushing had become thoroughly wet. Also, local structural conditions were such that raindrops were able to spatter to the under side of an insulator skirt, and this appeared to aggravate the conditions.

Tests simulating the local conditions were performed at a high-voltage laboratory and the previous observations were confirmed. Dry, semiconducting dust did not have an appreciable effect in reducing flashover voltage. Also, a fairly heavy water spray which washed off the tops of the insulator skirts before the under side became wet reduced the dielectric strength only slightly. However, optimum conditions for flashover were presented if the upper portion of the skirts retained some wet dust while spattering took place to the under side of the skirts. The striking appearance of the streamers which enveloped the entire bushing preceding flashover clearly demonstrated that this set of conditions must in a large measure have been responsible for the troubles which had been experienced.

Remedial measures to prevent upward splashing to the under side of the insulators were indicated. A large porcelain umbrella was designed for mounting over the bushing gauge glass and bolted to the bottom gauge glass support as indicated on the sketch. The annular space between the bushing and the glass was filled with a suitable insulating compound to keep out moisture, thus avoiding possible trouble due to freezing and resultant cracking of the glass from expansion. The compound used shrinks or cracks very little over a wide range of temperature.





Porcelain umbrella on 73-kv. bushing overcomes flashovers attributable to deposits from contaminated atmosphere

Lamp Flicker Awaits Ideal Motor Starters

Motor-starter equipment needed to reduce lamp flicker at a more reasonable cost — Starter performance reveals need for further developments in the low-price range

By L. W. CLARK
Detroit Edison Company, Detroit, Mich.

MANY of the commonly used motor starters in the low-price range are not effective for lamp flicker correction. And while the so-called network starters are satisfactory, their cost is high. Thus there is a definite need for the development of better performing motor starters at lower prices. These conclusions appear from a study of the performance of motor starters in mitigating lighting flicker. Specifically, the demonstrations showed that:

1. Manual compensators or any starters that open the circuit during starting are not effective in reducing lamp flickers.
2. Any type of starter that restricts the current to an initial low value and then allows it to increase gradually is most effective in lamp flicker control and should be recommended whenever possible.
3. Where push-button or automatic starting is needed the two-point single-resistance starter can usually be used. An adjustable resistor is essential in order that it can be adjusted in the field for minimum lamp flicker to meet the requirements of a particular application.
4. Finally, in those cases where automatic multi-step resistance starters or automatic compression type resistance starters are actually required, either kind is satisfactory, but both are costly.

Motor starters were once used to protect motors from heavy inrush currents. With the development of present-day motors, capable of across-the-line starting, that need has passed. Instead, the present need is for protection of the distribution system from the sudden high current drains of motor starting which cause voltage variations annoying to lighting customers. Yet, in spite of the change in the reasons for controlling and limiting motor-starting currents, there have been few or no changes in the means for doing so, the same general kinds and types of starters being offered now as then.

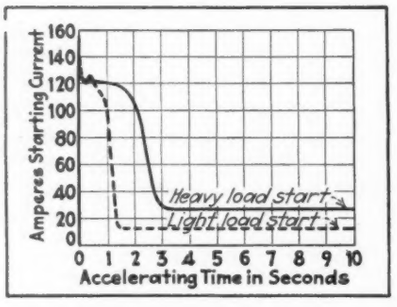


Fig. 1—Across-the-line starting, 10 hp. motor

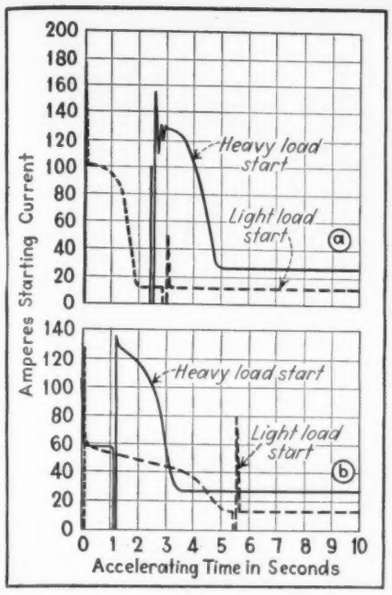
This graph of full-voltage starting may be used as a reference for comparison of effectiveness of the starters tested and whose performances appear in other graphs. For both heavy and light loads the initial current inrushes and resulting lamp flicker are about the same, the chief differences being in the time for the motor to come up to speed. The locked-rotor current of 124 amp. corresponds to an 8-volt flicker under the test conditions.

Twelve samples studied for flicker propensity

Obviously there are conditions in which across-the-line starting will have no bad effect on lighting service. Recognizing this, many utilities have set up statements defining the conditions for across-the-line starting. Where these conditions do not obtain the motor user is asked to install satisfactory starter equipment for the protection of lighting service to himself as well as to other customers. For the purpose of showing what motor starters would be satisfactory and what would not, manufacturers were invited to submit their products for demonstration. The step type or so-called network starters are in all cases highly effective, but too high priced to be considered a satisfactory solution to the problem. The accompanying graphs show the performance of the different starters, and from them it is clear that a big field is still open for development of a reasonable-priced motor starter that will do a job in reducing lamp flicker.

For the demonstration two motor sizes were selected, 10 and 40 hp., as being representative samples of what might be expected in the general run of jobs. The 10-hp. motor was rated 220 volts, 27 amp. full load current, three phase, 60 cycles and 124 amp. locked-rotor current. The load consisted of a battery-charging generator supplemented by a Prony brake, which could be adjusted for various degrees of starting torque requirements. The 40-hp. motor, driving a ventilating fan, was rated 220 volts, 97.4 amp. full load current, three phase, 60 cycles and 600 amp. locked-rotor current. In all, twelve starters were included in the demonstration, of which the typical results are shown in the accompanying graphs.

For the demonstration the starters were mounted side by side and above each was placed a chart showing the starting current drawn from the line. In the center of the board was an ammeter and vacuum tube oscillo-



Figs. 2a and b—Manual compensators, makes "A" and "B," 10-hp. motor

These graphs show performances of the most common type of reduced voltage starter. Both compensators have taps for obtaining either 65 or 80 per cent of line voltage, which will theoretically reduce the line current to 42 and 64 per cent, respectively. The compensator of (a) is connected on the 80 per cent tap and of (b) on the 65 per cent tap. With light starting-duty requirements, either tap was sufficient to bring the motor up to normal speed at the reduced voltage, but with the heavy torque requirements neither could start the motor. The significant characteristics shown on both curves are the opening of the circuit during the transition from reduced to full voltage, resulting in the line current dropping to zero, and then striking a new high value when full voltage is applied. Flicker observers reported the compensator as being no improvement over full-voltage starting, but in some instances being definitely worse.

graph, by means of which the observers could check the values shown on the charts. In addition there were reading lamps placed around the room by means of which the lamp flicker could be checked. Inasmuch as the effect and improvement on lamp flicker is the real answer to whether a starter is effective for such an application, it is unfortunate that the effect of lamp flicker cannot be reproduced in print with each graph.

Resistance adjustment needed

It was apparent from the demonstration that there is need for means to vary the amount of resistance in the primary resistance starter. The value of a starter of this type is directly dependent on its capacity for adjustment to the conditions in which it operates. For loads such as fans, pumps and motor-generator sets, where the starting torque requirements are not severe, probably the best arrangement is to insert as much resistance as possible and yet produce sufficient torque for the motor to come up to speed. In this way the initial flicker can be reduced to one-half or two-thirds its original value, and with the motor up to speed there is no second flicker when the resistance is shorted out.

For heavy starting-duty loads, such as line-shaft drives, tumbling barrels, some compressors, etc., the motor will not start with any appreciable resistance in series with it, consequently the best plan is not to attempt to start the motor on the resistance step, but to insert sufficient resistance to reduce the flicker to two successive flickers of half magnitude, with the motor actually starting when the resistance is shorted out. Such a change is of doubtful value wherever the flicker is visible, but it does materially reduce the area and resultant number of customers that will be affected. To meet these two conditions it is necessary that there be some means of adjusting the value of resistance.

In addition there is a further need for an adjustable resistor because of variations in the impedance ratio characteristics of the supply system. The reduction of motor-starting current by the insertion of resistance improves the power factor of the motor current and consequently the lamp flicker is not always reduced in direct proportion to the reduction in starting current.

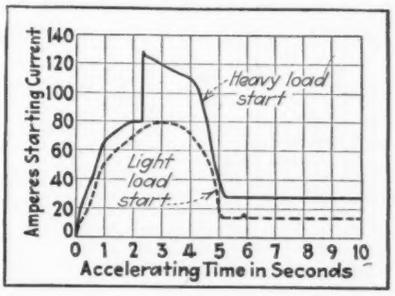


Fig. 3—Compression resistance starter, hand operated, make "C," 10-hp. motor

The current gradually increases as the handle of the starter is raised. With heavy-duty starting, the torque developed at the point of maximum compression is not sufficient to start the motor, resulting in a sudden inrush of current as a contactor shorts out the resistors at the completion of the stroke. However, even under this condition the sudden flicker has been reduced from 8 volts to about 2 volts with a gradual reduction of 6 volts. Flicker observers reported this starter as satisfactory in the reduction of flicker. In fact, none of the others in the reasonable price range even approached its effectiveness. As it costs no more than a compensator and does a good job of flicker reduction, it appears that this type of starter or any starter that causes a gradual change in voltage rather than a sudden dip bears the most promise.

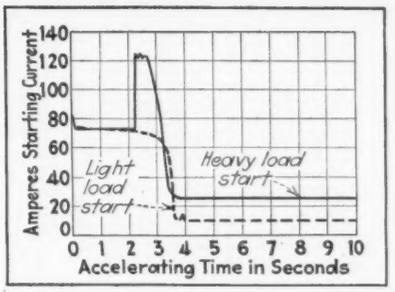
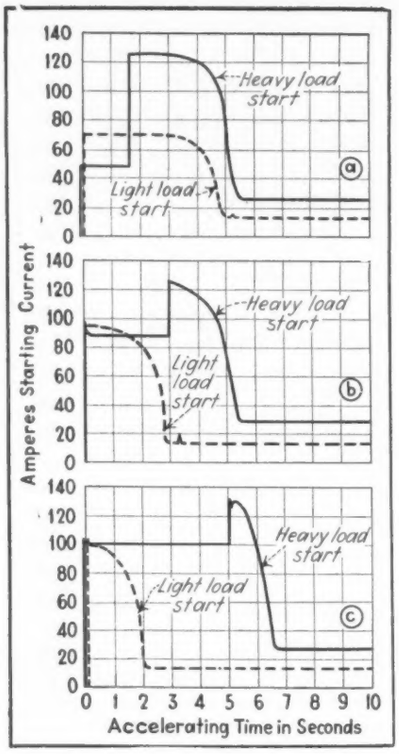


Fig. 4—Reactance starter, hand operated, make "E," 10-hp. motor

A single step of reactance limits the starting current to about 60 per cent of locked-rotor value with a corresponding reduction in lamp flicker. The transition from the starting to the running position is accomplished by shorting out the reactance and applying full line voltage to the motor without opening the motor circuit. The actual operation consists of pushing the operating handle to an upright position, dropping back part way toward the off position, and then returning to the upright position. With light-duty starting lamp flicker is substantially reduced and for heavy-duty starting the flicker is reduced to two successive flickers of approximately half magnitude.

Extent of this variation for the range of conditions encountered on one distribution system is shown in Fig. 6. Perhaps the spread here is greater than average due to the common use of the open-delta transformer connection on this particular system. With a balanced supply system, maximum voltage drop for a given value of load current occurs when the power factor of the current equals the ratio of resistance to impedance of the supply circuit. For the matter of convenience this ratio may be termed "impedance ratio," and in the typical balanced distribution system may be anywhere between 40 and 75 per cent. However, with the open-delta connection and resulting 30 deg. shift in phase angle the resulting "impedance ratio" is considerably greater than the actual ratio of resistance to impedance and has an upper limit of about 95 per cent instead of 75 per cent.

From the curve drawn for the minimum and maximum limits of 40 per cent and 95 per cent impedance ratios, it can be seen that a resistance starter that would reduce the lamp flicker on a 40 per cent system to one-half value must reduce the current to 60 per cent of locked-rotor value, and that a starter that would reduce the lamp flicker on a 95 per cent system to one-half value must reduce the current to 35 per cent of locked-rotor value. Thus to meet this range of conditions, it is necessary that the primary resistor be capable of limiting the current to either 35 per cent or 60 per cent of locked-rotor value.



Figs. 5a, b, c—Push-button, primary resistor starters, makes "C," "D" and "B," 10-hp. motor

These graphs show performances typical of the five primary resistor, automatic push-buttom starters submitted. In operation they are all very similar, a fixed block of resistance being inserted in series with the primary of the motor at the start, and after a fixed time delay of a few seconds a contactor automatically shorts out the resistor, applying full line voltage to the motor. They are slightly more expensive than hand starters, as would be expected. Three of the starters had about the same amount of resistance, only enough to reduce the voltage and current to 75 or 80 per cent of full voltage locked-rotor values. The two others, including that of (a), have the added feature of an adjustable block of resistance with a maximum value sufficient to reduce the current to a minimum of 30 to 35 per cent of locked-rotor value. The starters of (b and c) do not introduce sufficient resistance to accomplish any appreciable improvement in lighting flicker.

For all practical purposes, a starter that has taps for 35, 55 and 75 per cent voltage values should be adequate for any location. The curve is drawn for a motor that has a locked-rotor current power factor of 40 per cent. For 50 or 60 per cent power factor locked-rotor currents the spread between maximum and minimum system conditions becomes less.

Referring to Fig. 5a, where the starting resistance was adjusted on the heavy load start to split a single 8-volt dip into two 4-volt dips it was necessary to have sufficient resistance in the circuit to reduce the current to about 38 per cent of locked-rotor value. The ratio of resistance to impedance of the supply circuit was about 95 per cent, thus roughly checking the calculated curve of Fig. 6.

Insufficient resistance provided

Typical resistance starters in which there is not sufficient resistance to reduce the current to a value that makes for an appreciable reduction in voltage drop are shown in Figs. 5b and c. For instance, in Fig. 5c the current is reduced to 80 per cent of locked-rotor value, but while the corresponding reduction in flicker may be to 75 per cent of locked-rotor value on a 40 per cent system, there would actually be an increase in flicker on a 95 per cent system. Obviously, the added price of such a starter as compared with across-the-line starting cannot be justified from the standpoint of flicker reduction.

Certain manufacturers have agreed to provide sufficient resistance in their standard two-point push-button resistance starters to limit the current to a minimum of 35 per cent, with possible tap connections for 55 and 75 per cent values. However, any two-point resistance starter, even with adequate resistance, is not as effective in the reduction of lamp flicker as the type of starter that allows the motor-starting current to increase gradually rather than in one or two steps. If there were such an ideal starter available in the automatic push-button type, *at no increase in cost,* it would certainly be approved in preference to the two-point resistance starter.

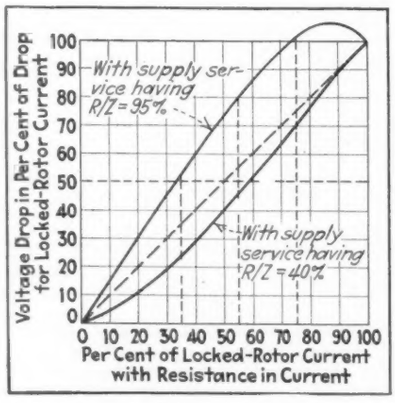

With supply service having R/Z = 95%
With supply service having R/Z = 40%
Voltage Drop in Per Cent of Drop for Locked-Rotor Current
Per Cent of Locked-Rotor Current with Resistance in Current

Fig. 6—Why multiple taps are necessary on resistance starters

With an "impedance ratio" (see discussion in text) of 95 per cent, resistance is needed in the starter to reduce starting current to about 35 per cent of locked-rotor current in order to cut to one-half the flicker caused by locked-rotor current. A starter with a 75 per cent tap reduces the flicker drop to 70 per cent on a 40 per cent system, but slightly aggravates the flicker on a 95 per cent system. The 55 per cent tap is not satisfactory for the 95 per cent system either. The need for lower current taps, to permit adjustment to system conditions, is plainly indicated by this graph.

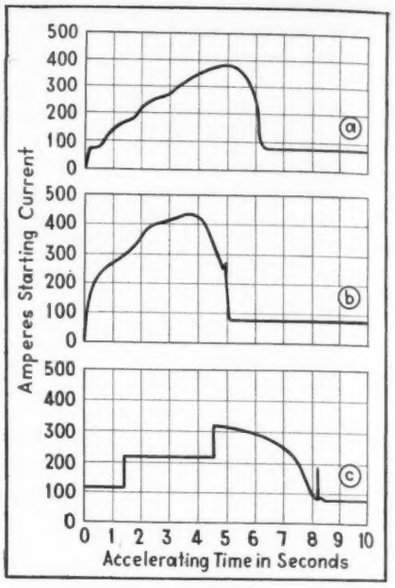


Fig. 7a, b and c—Network type starters, makes "C," "C" and "B," 40-hp. motor

Here are the performances of three types of starters, all of which are effective in reducing lamp flicker. The one of (a) is of the manual compression resistance type and compares in price with a compensator of the same size. As with the 10-hp. size, this type of starter does the best job of flicker reduction per dollar invested. The starter of (b) gives the same results with push-button operation, but costs nearly twice as much as the motor it starts. The starter of (c) is nearly as expensive. The performances of these starters show that lamp flicker, if not too excessive, can be made practically unnoticeable by installing proper equipment.

The 40-hp. motor starting full voltage caused a lamp flicker of 10 volts on the demonstration set-up, while with any of these starters the motor was started with practically no noticeable disturbance to the lights. In the case of the compression starter, there was a gradual reduction of 5 to 6 volts and with the step starter individual steps not to exceed 1½ to 2 volts. Neither would be noticed by the average person.

The demonstration showed, first, that many of the commonly used motor starters in the low-price range are not satisfactory when used for lamp flicker correction, and, second, that while the so-called network starters are satisfactory, their cost is high and there is a definite need for the development of more satisfactory starters in the low-priced field.

Selling Ranges, Water Heaters in Natural Gas Territory

By H. R. SEACAT

Kansas Electric Power Company, Lawrence, Kan.

IN SPITE of the belief that electric ranges and water heaters could not be sold in volume in its low-cost natural gas territory, the Kansas Electric Power Company three years ago decided to do the job anyway. Among its 21,000 customers there were 195 electric ranges and no water heaters at all.

The company's range and water heater program was directed toward three objectives:

1. To build a respected sales organization capable of selling a volume of ranges and water heaters.
2. To establish a faith in electric ranges and water heaters throughout its entire employee organization.
3. To create a market for electric cookery and water heating throughout the territory; thus enabling the sales organization to sell a satisfactory volume at a reasonable cost.

High type salesmen necessary

In developing our load-building organization, we have found that a respected, permanent, high type salesman is necessary to develop an electric range and water heater market. Our best prospects for this equipment at the start were in the higher income group. The salesman had to be equipped to meet this type of customer. Then we found that our early sales required from eight to ten calls before closing, so the salesmen had to be tactful, resourceful as well as congenial. We now have in our four larger communities eight specialists selling only electric ranges and water heaters. Each salesman has from 1,200 to 1,500 meters. In addition, we have seven general salesmen selling electric ranges, water heaters, refrigerators and laundry equipment in small towns and widely scattered communities. These salesmen have from 700 to 1,200 meters. Our sales department today is one which commands the respect of our entire organization and a majority of the men are producing a satisfactory volume. However, our strict requirement for high type men reduced the volume at the beginning of the activity.

At the start of the electric range and water heater activity our employee organization was somewhat skeptical of the idea. However, after numerous employee meetings, most of the members of the organization are firm believers in electric cookery. This is shown by the fact that 82 per cent of our employees earning more than $125 per month now own electric ranges.

In creating a market for electric ranges we have found that every sales promotional tool needs to be used in order to get results. A promotional rate is the first requirement. We have had such a rate since early in 1934.

After analyzing our record of the past three years we feel that our advertising has been too conservative. We have maintained a sizable newspaper advertising schedule since starting our program featuring the advantages of electric cookery. However, we are planning an even larger newspaper program, and in addition a sizable direct-mail and billboard schedule. We are planning to use personalized letters almost entirely for our direct-mail advertising. It is our opinion that the lithographed direct mail piece has been overworked in recent months.

Home service department valuable

We have found that a home service department is absolutely necessary to establish an electric range market. When we started developing the market electric ranges enjoyed the reputation of being terribly slow, very expensive to operate and extremely complicated. New users of electric ranges are more than anxious to place the blame for any baking failure on the new range. At the present time we employ four home economists. The economist calls upon each new user just as soon as the range is installed and maintains an organized system of follow-up calls on these users. In addition to this work the economists conduct cooking schools and small group demonstrations. They are gradually establishing themselves with newspapers in the territory and writing weekly articles for the papers.

The schools are also becoming acquainted with our home service department, and we feel that in the near future these girls will be able to carry regular stories to domestic science classes throughout the terri-

[*Continued on page 122*]

Three Years' Record of Range and Water Heater Sales by Kansas Electric Power Company

	1933 Saturation	1934 Sales	1935 Sales	1936 Sales	Total Sales	1937 Budget
Electric ranges	195	238	369	531	1,333	648
Electric water heaters	0	35	46	111	192	175
Kw.-hr. sold per residential customer	483	517	571	644		724
Kw.-hr. gain	4	34	54	73		80
Revenue per customer	$30.35	$31.17	$32.22	$34.39		$36.98
Cost per dollar of E.A.R.			0.65	0.58		

Commercial Cooking Sales on Competitive Basis

Demand characteristics and usage analyzed through installation of nineteen meters

By HOWARD A. HANDS
New England Power Service Company, Boston, Mass.

A FEW YEARS ago a new kitchen building was authorized and electrical equipment specified for all cooking and baking requirements except those utilizing steam for a large mental hospital under state jurisdiction in Massachusetts. The decision for electricity was reached after an exhaustive study by an independent architect-engineer in collaboration with the hospital superintendent and steward. Service is furnished by one of the operating properties of the New England Power Association.

To justify the estimates which we made at that time, it was agreed that a complete test of the energy consumption of every piece of cooking equipment would be made after the kitchen and bakery had been in operation long enough to enable the personnel to become fully acquainted with the various items. The bakery was started in August, 1936, and the main kitchen about four months later. It was deemed satisfactory to make the suggested test in the summer of 1937, and this was done between August 17 and 31. Through the courtesy of Dr. Clifton D. Perkins, acting commissioner of the Massachusetts Department of Mental Diseases, the results of these tests are released to ELECTRICAL WORLD.

These results indicate that the consumption of electricity for cooking in an institution of this type is such that electrification of the entire kitchen and bakery can compare favorably in cost with any fuel. In fact, the saving in the bakery alone, admittedly due to the electric oven, is sufficient to pay for more than 75 per cent of the cost of the electricity to operate it. The possibility of such savings plus others. tangible and intangible, attributable to electric cooking was foreseen by the state hospital authorities and their advisers, resulting in their decision to install the complete electric kitchen now serving so satisfactorily some thousand or more patients and their necessary attendants.

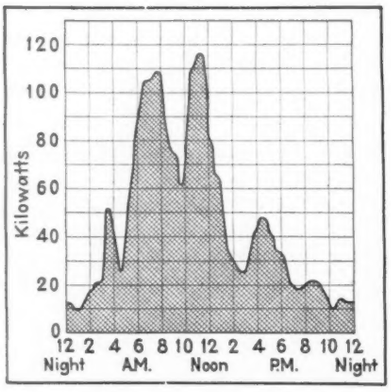


Fig. 1—Typical summer demands on kitchen, based on fifteen-minute interval
Consumption here averages 1,020 kw.-hr. per day.

Load characteristics

The type of load for such an institution as this does not lend itself particularly to high load factor operation; that is, long hours' use of the maximum demand. The preparation of a large number of meals for service during concentrated meal periods necessitates the coincidental use of most of the equipment, especially just before the noon meal. Thereafter only minor pieces of equipment are in use in the main kitchen; the bakery has completed its day's complement; the ventilation, and even the lighting requirements, diminish, and only the diet kitchen remains semi-active. Therefore, the figure of 2,700 hours' use of demand during the year, indicated by this test, is probably representative of what may be expected from such a hospital kitchen.

A typical 24-hour curve of fifteen-minute demands has been prepared (Fig. 1). It shows a peak at 11.30 a.m., which is due specifically to the overlapping of the main kitchen's noon meal preparation activities with the incompleted bakery operation. A peak almost as great occurs earlier in the forenoon, representing breakfast preparation superimposed on the bakery requirements. Throughout the entire day there is some activity in the diet kitchen and over the entire twenty-four hours an appreciable lighting and ventilation load. During the night a limited amount of food preparation is carried on for night employees. The curve varies somewhat from day to day, according to the menu, bakery activity (bakery not operated Sundays), etc., but the composite one prepared is a fair indication of normal activity. It represents a consumption of about 1,020 kw.-hr. per day, or 31,000 kw.-hr. per month.

Arrangements for tests

The institution incorporates a main hospital and service buildings supplemented by individual houses and farms classified as colonies. Most of the food is prepared in the main kitchen building, but is subdivided into various menus, according to whether it is prepared for the employees' cafeteria, for the patients'

Table I—Arrangement of Data for Tests of Equipment

		Analysis of Kilowatt-Hours—First Week					
Diet Kitchen	Kw.-Hr.	Bldg. Kw.-Hr.	% of Dept. Kw.-Hr.	% of Total Heat Kw.-Hr.	% of Total Heat Kw.-Hr.	% of Total Kw.-Hr.	% of Total Kw.-Hr.
Fryer	6		1.05	0.24		0.09	
Range No. 1....	238.5		41.80	9.34		3.52	
Range No. 2 ...	64		11.20	2.51		0.94	
Range No. 3....	245		42.89	9.60		3.62	
Toaster	10		1.75	0.39		.15	
Broiler	7.5		1.31	0.29		.11	
		571	100		22.37		8.43
Main Kitchen							
Broiler	47		7.03	1.84		0.69	
Fryer	108		16.14	4.22		1.59	
Toaster	40.25		6.02	1.58		0.59	
Cooking top No. 1	40		5.97	1.57		0.59	
Roaster No. 1..	32.5		4.86	1.27		0.48	
Range No. 1....	60		8.97	2.34		0.89	
Cooking top No. 2	25		3.74	.98		0.37	
Roaster No. 2..	56		8.37	2.20		0.83	
Range No. 2....	260		38.90	10.20		3.82	
		668.75	100		26.20		9.85
Bakery							
Oven	1,280		97.70	50.25		18.88	
Fryer	30		2.30	1.18		0.44	
		1,310	100		51.43		19.32
Total Heating .		2,549.75			100.00		37.60
Total Power ...	2,820	2,820					41.60
Total Lighting.	1,200	1,200					17.70
Total.....		6,569.75					96.90
Losses...		*210.25*					*3.10*
Total by boiler house meter.	3,112.8	6,780					100.00
Max. demand at boiler house.....						120 kw. (11 a. m.)	

cafeteria or colonies, for the officers and staff, or for special diets. The first three menus emanate from the main kitchen and the last two from the diet kitchen, with a single bakery common to both.

The entire electrical requirements for the kitchen buildings are purchased and supplied through three 50-kva. and four 25-kva. transformers located in a basement vault. These are fed through underground cables from the main switchboard in the boiler house, some 600 ft. away. A recording watt-hour meter is permanently connected into this circuit at the latter point so that a continuous record of the entire kitchen usage, including cable and transformer losses, is always available. In order to get a breakdown for power, lighting, cooking and losses, however, it was necessary to install additional meters at the distribution panel in the kitchen basement. A total of nineteen meters were placed in the power and lighting circuits and in each branch to every piece of electric cooking equipment. The consumption was noted weekly for two successive weeks and for a portion of the time even hourly readings were taken. In addition, a demand recorder was installed at the boiler house end of the line to give a graphic picture of the entire kitchen demand by fifteen-minute intervals.

The electric cooking equipment is listed below. It is standard with the exception of two cooking tops, which were provided with special griddles instead of the usual hotplates.

Main Kitchen	Kw.
1 T21 toaster	4.1
1 KA14 fry kettle	15
2 RA111 ranges	44
2 942R116 cooking tops	16
2 NA129 roasting ovens	12
1 B11 broiler	12
Sub-total	103.1
Diet Kitchen	
1 4-slice Toastmaster toaster	2.45
1 B1 broiler	5
3 RA121 ranges	27
1 KA15 fry kettle	4
Sub-total	38.45
Bakery	
1 A400 bakeoven	55
1 KA14 fry kettle	15
Sub-total	70
Staff Serving Room	
1 4-slice Toastmaster toaster	2.45
Cooking load total	214

The connected motor load for the building totals 69 hp. The 25-hp. motor shown in the following list is used to drive a fan exhausting vapors and fumes produced in the cooking processes. Other motors are for elevators, refrigeration, bakery and kitchen machinery, etc. The lighting throughout the building is ample, so that a connected load of 19 kw. is

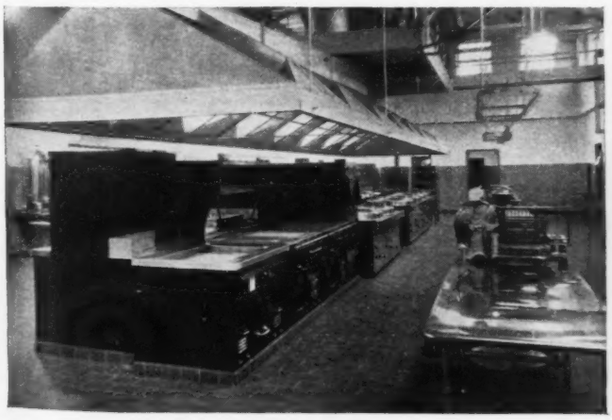


Fig. 2—Main kitchen at state institution has 103 kw. of connected load for cooking to serve 1,300 people. Uses 2,600 kw.-hr. per month

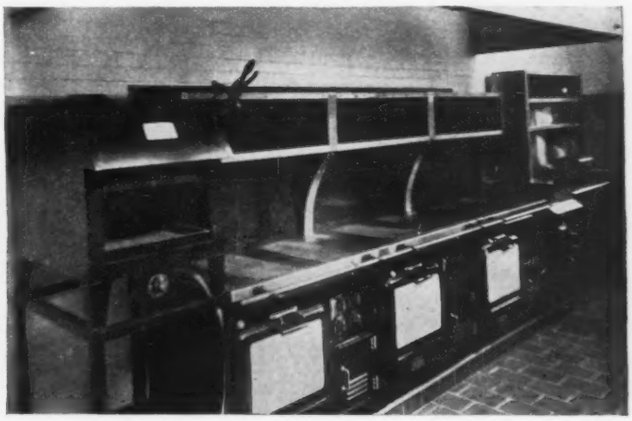


Fig. 3—Diet kitchen at state institution has connected load for cooking of 38-kw. and uses approximately 2,500 kw.-hr. per month

not surprising. The total connected electric load is, therefore, approximately 300 kw.

At the time this test was made the average population served from these kitchens approximated 1,370 people, divided as follows: Patients, 1,016; employees, 284; officers and staff, 30; special diets, 40.

Details of tests

Although readings of the consumption of electricity for the various individual pieces of equipment were taken hourly for a portion of the test period, the weekly summaries (Table I) contain the pertinent information most desired, and can be assumed as fairly representative of average summer operation.

On the basis of the first two weekly tests, monthly summaries figure as follows, total meals served being 125,000:

	Kw.-Hr. per Month	Per Meal Kw.-Hr.	Per Meal People
Diet kitchen cooking	2,478	0.388	70
Main kitchen cooking	2,600	0.022	1,300
Bakery cooking	5,825	0.0466	1,370
Total cooking	10,903	0.0873	1,370
Total power	11,639	0.0932	1,370
Total lighting	5,049	0.0404	1,370
Total kitchen	27,591	0.2209	1,370
Losses	856	0.0068	1,370
Total	28,447	0.2277	1,370

The refrigeration load was extremely heavy during the test, partly because of a large consignment of freshly killed hogs and partly because of abnormally high outside temperatures. The mean temperature for the first week was 75.4 deg., six degrees in excess of normal, and for the second week 70 deg., two degrees above normal.

The entire consumption as indicated by this test was probably considerably in excess of the average for the year. During these two weeks the total kitchen load averaged 6,500 kw.-hr. per week, whereas the figures in Table II show an average of only 5,800 kw.-hr. per week for ten weeks starting April 5.

Table II—Electric Consumption for Ten Weeks

Week of	Kitchen Total	Bakeoven Only
April 5	5,770	1,410
April 12	5,700	1,230
April 19	5,700	1,360
April 26	5,620	1,440
May 3	5,620	1,330
May 10	5,730	1,420
May 17	5,920	1,260
May 24	5,890	1,350
May 31	5,780	1,300
June 7	6,270	1,090
	58,000	13,190

Since the ten-week average of 1,319 kw.-hr. for the bakeoven alone agrees very closely with the test average of 1,341 kw.-hr., it is logical to assume that the difference in totals is due to increased refrigeration load. The lighting load during the summer test is probably less, if anything, than the ten-week average, since for the first three weeks of the latter period daylight saving is not in effect in Massachusetts and, therefore, a somewhat heavier than average consumption can be expected for lighting. Probably the ten-week average represents the minimum consumption period for the year, with the two-week test period giving the maximum.

In view of the foregoing data, it is probable that a monthly summary more in line with the average conditions for the entire year would be as follows:

	Kw.-Hr. per Month	% of Total	Per Meal Kw.-Hr.	Per Meal People
Diet kitchen cooking	2,500	9.3	0.392	70
Main kitchen cooking	2,600	9.6	0.022	1,300
Bakery cooking	5,750	21.3	0.046	1,370
Total cooking.	10,850	40.2	0.0868	1,370
Total power...	10,250	37.9	0.082	1,370
Total lighting.	5,100	18.9	0.0408	1,370
Total kitchen..	26,200	97.0	0.2096	1,370
Losses	800	3.0	0.0064	1,370
Total	27,000	100.0	0.216	1,370

For estimating purposes the following round number figures may be deduced from the foregoing summary:

Ratio of patients and employees to special diets	18 to 1
Kilowatt-hours per person per meal —main kitchen	0.025
Kilowatt-hours per person per meal —diet kitchen	0.400
Kilowatt-hours per person per meal —bakery	0.050
Kilowatt-hours per person per meal —Total	0.095
Ratio of consumptions—bakery to main kitchen to diet kitchen....	50–25–25
Ratio of consumptions—power to cooking to lighting	40–40–20

Detailed observations of the operations of the various pieces of equipment in the main kitchen were made, but they are probably valuable mainly in permitting some general statements to be made. For example, the range tops in the main kitchen are used very little, and then almost entirely for the preparation of employees' rather than patients' menus. The same applies to the broiler. But the ovens, both the separate ones and the range ovens, are used almost every day. The fry kettle is a very useful piece of equipment and is used frequently, but really should have greater capacity in order to handle the heavy load placed on it. To an outsider it might seem feasible to utilize the bakery fry kettle to supplement the one in the main kitchen, but the very logical desire of the hospital authorities to keep the activities of these two departments entirely independent of each other makes such a suggestion impracticable.

Diet kitchen important

The second department, namely, the diet kitchen, can stand more attention than is ordinarily given it. This is apparent from the fact that its consumption for only 70 people is approximately equal to that of the main kitchen serving 1,300. Most of the diet work consists of cooking small quantities of numerous items, involving considerable hot-top operation. It is comparable in a way to a tea room or small restaurant which has a rather concentrated meal hour with a fastidious clientele. Short-order equipment is, therefore, more desirable than the heavy-duty institutional equipment, with specialized items used wherever economically feasible.

APPEAL TO SPORTSMANSHIP

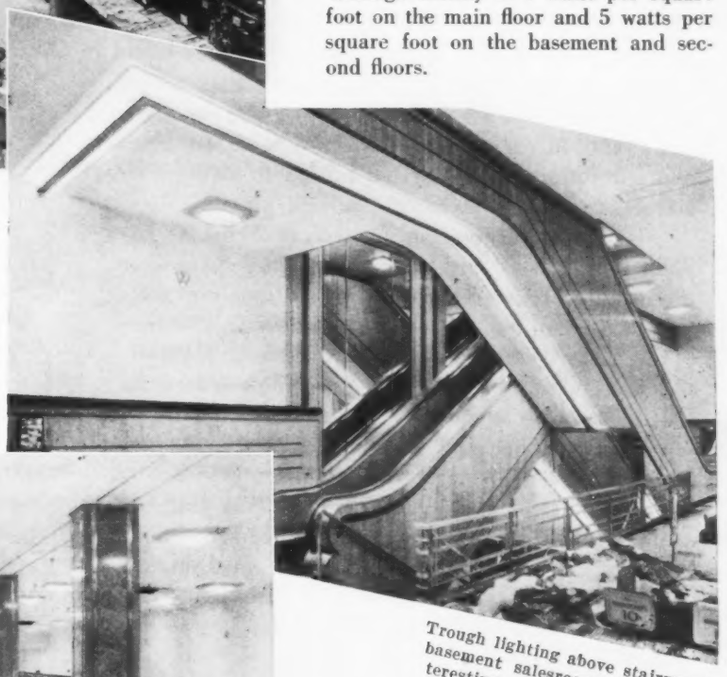
THE AVERAGE ELECTRIC BILL last year was only 9 cents per day per family. The total cost of electricity to all families in the United States was less than motorists pay in taxes alone on gasoline and only two-thirds of the amount of taxes on liquor and tobacco. In the last 25 years the cost of living has increased 44 per cent; but the cost of electricity has dropped 50 per cent. In the face of this record the American public, noted for its sense of sportsmanship, should call a halt on the utility raid.—DAMON E. HALL, *counsel for Worcester Suburban Electric Company, before Massachusetts Department of Public Utilities.*

Store Lighting Trend Exemplified at Woolworth's

LIGHTING in the newly opened store No. 1,000 of F. W. Woolworth Company, in the heart of New York's fashionable shopping district, adds to the current trend in store illumination toward the use of light to create the impression of spacious dignity. Illumination intensity from semi-flush direct-lighting units in the high ceiling is between 50 and 60 ft.-candles in the main body of the store. Luminaires use a semi-concentrating X-ray silvered reflector mounted in the hung ceiling and house a 750-watt bi-post base lamp. Pyrex glass treated to give a slight diffusion is over the mouth of the reflector at the ceiling level. Concentric and radial louvers are part of the ornamental framework which holds the glass in place.

The store's maximum lighting demand is estimated to be 284 kw. Wattage density is 7 watts per square foot on the main floor and 5 watts per square foot on the basement and second floors.

The main floor, 81 x 145 ft., is divided into three sections by two rows of pillars. Side sections have a ceiling height of 18 ft., the center section 19 ft. 8 in. Outlets, of which there are 86 on the main floor, are on 10-ft. 6-in. by 11-ft. centers. Ceiling height is accentuated by the use of cove lights around the bays to brighten the ceiling. The trough contains 60-watt lamps on 12-in. centers.



Trough lighting above stairway to basement salesroom lends an interesting touch to the architecture. The trough contains a double row of 60-watt lumiline lamps on 18-in. centers. On the other hand a single direct-lighting unit is over the escalator to the second floor.

Photo courtesy General Electric Co

The basement has a 14-ft. 9-in. ceiling and uses the same type of unit that is used on the main floor. There are 105 of these luminaires, each with 750-watt lamp, on this floor. Unlike the main floor, there is no provision for cove lights. Reflection from the bright floor and side walls makes the ceiling bright.

Editorials

S. B. WILLIAMS, Editor

The Case for Organized Sales Training Programs

OUT of the many forward-looking addresses made last week at the fifth annual Sales Conference of the Edison Electric Institute few of them represented a more specific treatment of a broad current utility problem than that of C. A. Eastman of Ebasco Services, which presented the case for organized training of the sales departments of utility companies.

The sales problem might be said to be as broad as the utility industry itself, for in the last seven or eight years before our very eyes we have seen the utility companies become decidedly more sales conscious. Load building could well be and was a secondary matter a decade ago when the big job of management was to provide enough capacity to keep ahead of the ever-rising demands. Those were the good old days, when the load was doubling itself every five years and management received without too much effort the new dollar of gross needed to support the six or seven-dollar investment in new plant.

During the depression, however, many of the new dollars of gross vanished, but the fixed charges on the investment were inescapable. And thus ever since those days load building and sales, as the only sources of new net, have had increasing attention.

We are traveling along the road now toward the goal of knowing as much about the kilowatt-hours we sell as we do about the kilowatt-hours we manufacture. It would seem to be high time for both branches of our business to be well organized for the long pull, for, as the record so plainly shows, it is not enough simply to manufacture our product of kilowatt-hours, but we must also go out and sell them.

Cost data of recent years show the largest portion of load-building expense goes to pay the personnel, and it is here that attention is most needed and it is here that such attention can well be expected to yield far-reaching benefits over the long term.

In brief, load building and sales have left their adolescent "pots and pans" era far behind and are rapidly coming of age as an integral component of the utility industry. How fast they develop will be governed by managerial direction of man-power.

The managerial interest, on the one hand, was evidenced by the larger number of executives at a conf rence devoted to sales and load building. On the other hand, with prime mover installed capacity increasing only 5 per cent net in the last five years, then competent direction of sales man-power becomes essential. At the base of it all is continuous, systematic, organized training in good times and bad so that we can move nearer the time when a larger proportion of the kilowatt-hour output of our $13,000,000,000 plant will likewise be bought and paid for in good times and bad.

•

It Is Now Up to SEC

ONE BY ONE the legal battles that the electric utility industry has been forced to engage in to protect the interests of investors against New Deal legislation have been decided, and while they have gone against the utilities, they have clarified the situation by giving judicial decision to debatable questions. For the most part, the decisions have been clear and have covered the ground.

So far the SEC has shown a disposition to be patient and reasonable, nor is there any reason to believe that in the rôle of victor it will change its policy. The Supreme Court did not decide the major question of the constitutionality of the utility act. At the same time the industry is weary of long-drawn-out legal battles which have a tendency to cause investing confidence to be withheld. It is to be hoped that the SEC will continue to administer the act in a way that will give no cause for further litigation.

•

New Capacity for the 1940 Peak

A YEAR ago the utilities were falling over themselves ordering generating equipment. Today new orders for turbines are about as scarce as hen's teeth. The manufacturers are running full tilt on equipment ordered months ago and will probably remain busy for the balance of the year. Shipments scheduled for 1939 deliveries, however, are woefully small—and that is an unhealthy situation.

While current energy output in itself does not warrant new plant capacity, it must not be forgotten that it takes from eighteen months to two years from the time of negotiation for new capacity to get into service. The shipments of new units this year will undoubtedly be ample to take care of any peak that might develop this fall and probably 1939 as well, but if business does take a strong upward trend following the current recession the 1940 peak can easily prove embarrassing.

While it is true that load forecasting has been thrown into a confused state due to the rapid fluctuation in industrial demand and it is no longer possible to forecast with any assurance, the mere fact that turbines take so long to build should make it prudent to order new generating equipment when current busi-

ness seems worst. If utilities wait until there is a strong pick-up in consumption they will again find themselves competing with others for manufacturers' engineering and production services.

To serve this business manufacturers need an engineering force and a production force. It takes time to build up a competent personnel of both kinds, and when through lack of business these forces have to be reduced, the industry suffers when business again returns. Right now shop production labor is busy, but the engineering departments are not. It is in this latter department that the congestion will occur later in placing orders if this force is permitted now to disintegrate.

Under an orderly flow of business turbine manufacturers could turn out a larger volume and individual shipments could go through quicker, but periods of feast and famine so disrupt the working forces as materially to reduce production capacity. Under the circumstances the customer is bound to suffer.

Therefore, in spite of the fact that energy output is down and in spite of the fact that a substantial volume of new capacity is being installed this year, it would seem to be a practical thing for utilities to start now negotiations for new generating equipment to take care of the 1940 peak.

•

A Century of Wood Conservation

OFFHAND one would guess that wood preservation has been a conservation practice of only three or possibly four decades. Actually, however, the American Wood Preservers' Association traces the history back to an 1838 venture. Pressure treatment was instituted by a small Massachusetts railroad as early as 1865, so this country has seven decades of benefit from the art instead of three or four. What it has done to extend the reach of a dollar and the usefulness of a felled tree to pole-using utilities can only be estimated. Such an estimate has been made for the railroad and it runs to the amazing sum of $145,000 a day. That figure can be believed by any one who will recall the prominence of the section gangs along the rights-of-way before the advent of the creosoted tie and rock ballast.

A readily comparable benefit has accrued to the utilities. Barring a battle with an errant automobile, a treated pole can now serve practically twice as long as an untreated one, and the gain in operating expense is far more than just the saving on the pole itself because of the changeover labor involved. Sterile timber under this technique ceases largely to be an organic substance and takes on the permanence of other durable materials.

The power industry has good reason to salute the wood-preserving industry on what it considers its century mark. These latter decades have seen an increasingly co-operative relationship between preservers and users of wood poles. It has resulted in a progressive contribution to economic distribution of energy over the pole lines that have to combat the destructive inroads of bugs, moisture and soil attack.

•

Local Geography Enters the Selective Selling Picture

ENGINEERING, operating, accounting and sales departments combining their efforts to achieve the goal of increased net earnings with a minimum of new plant, coupled with fewer service complaints, lower costs to serve and more efficacious sales efforts, seems at first thought no more plausible than Snow-White and her seven dwarfs. On the contrary, however, such are the purposes of an experiment under way at the present time in a test territory being studied by Utility Management Corporation.

Very briefly described, the test area involves 12,000 meters in a residential section with a connected load of 5,500 kw. and served through six or seven substations. In areas where it was found that the respective substations were overloaded, sales efforts by the company have been confined to building off-peak load. In the other areas where unused substation capacity was found to be always available, the company's sales efforts have been stepped up for all classes of new residential load.

No claims were made for the plan when it was outlined last week at the annual Sales Conference of the Edison Electric Institute, because, as a matter of fact, the experiment is even now only in the process of development.

Regardless of the results which may be shown, however, the experiment helps to focus attention on a pressing operating problem of today. For this experiment is an attempt to remedy at the source the disconcerting fact faced by the utility industry recently in finding that its gross in 1936 had finally been restored to the levels of 1930, but its 1936 *net* operating income was below the levels of 1930.

Secondly, it was shown that the same group of companies which in 1931 was investing anywhere from 71 cents to $6.49 to gain a one dollar increase in gross was now finding it necessary to invest from 86 cents to $7.48 to gain a one dollar increase in gross.

It was facts of this same general nature which led the Woolworth management to throw its traditional 10-cent top limit into the discard so that it might meet more successfully the new conditions of modern times. If our utility companies are destined to become ever more and never less near the competitive arena of business, it would seem that there could well be a closer alliance between system building and load building. As one method, currently on trial, of approaching this desirable goal, the experiment will be watched with great interest by the utility industry, particularly those portions which are most interested in safeguarding their present cash positions.

Government Competition Drives Investors from Utilities

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

THE scene is the executive office at the White House. The President is enjoying his twice a week visit with the Washington newspaper men. He is in rare good humor. He has just talked with two prominent public utility officials, one from Pittsburgh, the other from Philadelphia.

In his best "I told you so," or "We planned it that way" manner the President tells the "boys" how he has just faced down these representatives of the great industry which is so important, as he sees it, in the "capital strike" which is holding back prosperity. The utility men, he told the press, had been compelled to admit, to his categorical questions, that there was no threat of government competition with the Philadelphia and Pittsburgh electric systems.

Why, then, the President demands, first of the utility executives and later of the newspaper men, is there any fear on the part of investors? Why do they hesitate to put their money into what is obviously a good business? Why is not this billion dollars a year estimated to be needed to keep the industry abreast of the growing demand not being used, thus helping to solve the unemployment problem?

Still no threat

All that was just a few months ago. There is still no immediate threat by the government at the electric industries of Philadelphia and Pittsburgh. But the investors still seem reluctant. They may not have read Alfred M. Landon's campaign speeches two years ago—certainly they did not listen to them if there was anything else on the radio—but most of them seem actuated by one phrase which the Kansas aspirant used a good many times: "No one can be sure!"

For instance. Consider a public announcement by the Federal Power Commission dated April 1. It is headed "Federal Power Commission prepared to begin Fort Worth (Texas) survey on or about April 10."

It outlines a promise that the commission will supply experts, at cost, to make a preliminary estimate of cost for an electric distribution system for Fort Worth, "and a forecast of the power requirements of that city during the next decade."

The Lower Colorado River Authority sent a telegram to the Power Commission, quoted in the statement: "Am advised Fort Worth has requested your commission to make power survey of city. Inasmuch as Lower Colorado River Authority has been negotiating with city for sale of power, we trust the commission may see fit to comply with the request and make information available to the Authority."

Further down in this statement:

"The proposed survey does not contemplate appraisal and valuation of the privately owned electric facilities now serving the city, but an engineering estimate of the cost of constructing a new distribution system capable of serving the entire city at the present time and for some years in the future."

Mr. Roosevelt might have obtained more information about the "capital strike" if he had talked to the heads of this Fort Worth privately owned system. He might have understood why there was no rush of investors to buy its common stock, assured that TVA was far away and there would be no threat of government competition!

Curiously enough, since the day of that press conference, and after a Supreme Court decision upholding the government's right to encourage, by grants and low interest loans, construction of municipal electric projects, the President told the newspapermen he expected the local government units involved would at once begin negotiations with the privately owned plants with a view to buying them out, so that there would be no duplication of facilities.

In an interview with public utility men from Utah and nearby states he made it clear that he thought duplication of facilities was waste, and that some device should be employed to avoid such an economic error.

The voice was the voice of Roosevelt, but the intent seems to have been the intent of George W. Norris.

Tergiversation

There is a story of Woodrow Wilson, during the ticklish Mexican trouble days. He was asked by newspaper men what he had talked to the English Ambassador about. He replied that he had not seen the English Ambassador.

Reproached by a friend who was present, afterward, Mr. Wilson is alleged to have smiled: "They asked me about an *English* Ambassador. There is no *English* Ambassador. I did see the *British* Ambassador."

For, leaving out the little question of federal subsidy now approved by the Supreme Court, this is *local* competition threatening the electric system in Fort Worth. Says the same statement of April 1, already quoted:

"The Lower Colorado River Authority is a state agency created by the Texas Legislature for flood control, reclamation and hydro-electric purposes. Its program provides for the construction of four dams, all to produce electric power, on the Colorado River, of which two are practically completed and two are under

[*Continued on page 123*]

News OF THE WEEK

Select Congressional Committee to Begin Investigation of TVA

Five Representatives and three Senators chosen to serve on joint committee investigating activities of TVA — Senators Borah, McNary and Capper decline to serve, while Senator Frazier defers his reply

The joint Congressional committee to investigate the activities of the Tennessee Valley Authority began its preparations this week as five Representatives and three Senators were chosen. Three Senators declined to serve and one deferred his answer. General comment was that the House members had been wisely chosen, with comment on the Senate selections reserved until the two others had been named definitely.

Vice-President Garner named Senators Vic Donahey, Ohio; Fred H. Brown, New Hampshire; H. H. Schwartz, Wyoming; William H. Borah, Idaho, and Charles L. McNary, Oregon. Senators Borah and McNary, Republicans, stated immediately after their appointment that they would not serve on the committee.

Senators Arthur Capper, Kansas, and Lynn J. Frazier, North Dakota, both Republicans, were named in place of Senators Borah and McNary. Capper refused to serve, while Frazier delayed his reply, saying he had not yet made up his mind. Meanwhile, Senator James J. Davis, Pennsylvania, Republican, was seen as the possible fifth delegate, and was reported willing to serve. With both Senators Frazier and Davis on the group, there would be one more Senator with leanings toward the present TVA setup than against.

Speaker Bankhead named Representatives James M. Mead, New York; William J. Driver, Arkansas, and Ewing Thomason, Texas, Democrats and Thomas A. Jenkins, Ohio, Charles A. Wolverton, New Jersey, Republicans.

Senator Donahey, Democrat, has at times opposed the White House, but his record is strongly anti-utility. He has praised Dr. Morgan highly for his Miami project work.

Senator Brown is a New Dealer and avowedly anti-holding company.

Senator Schwartz declared that "I am thoroughly impartial and I can remain so." His record is anti-utility.

Rep. Mead is pro-Administration. He declared: "I am a neutral in power legislation."

Rep. Driver is also pro-Administration. He has been a prominent advocate of more federal flood control.

Rep. Thomason says he is "independent and impartial." As former Mayor of El Paso and Speaker of the Texas Legislature he has had some contact with utility problems.

Rep. Jenkins has anti-utility leanings, derived largely from REA'S troubles in Ohio with wholesale purchases from private power companies. He is an ardent supporter of REA.

Rep. Wolverton is anti-Administration. He says: "I have no preconceived views with respect to the subject matter of the investigation. It should be full and fair."

•

Southwestern Utility Plans to Install 15,000-kw. Unit

Southwestern Gas & Electric Company plans the installation of a 15,000-kw. turbo-generator, complete with condensers, pumping equipment, boilers and cooling tower, this year, according to A. Lieberman, president.

Mr. Lieberman stated that the installation will be at the company's main generating plant at Shreveport, La., and will increase the capacity to 45,000 kw. Under the Louisiana laws the company is allowed a ten-year exemption from taxes on the additional investment.

• • •

Utility Holding Units Quit Chicago

Led by the removal of headquarters of Middle West Corporation to Wilmington, Del., an exodus of utility holding companies from Chicago is threatened as a consequence of greatly increased personal property tax levies directed against holdings by such companies of stocks of subsidiaries.

Assessor John S. Clark declared that holding companies incorporated in other states will not be able to escape paying Cook County taxes by moving their headquarters out of Illinois. Mr. Clark held that his office will exercise its authority to make back tax assessed valuations for prior years against individuals or corporations attempting to avoid taxes by making their business residence in another tax jurisdiction.

Mr. Clark has fixed 1937 assessed valuations of more than $30,000,000 against approximately 30 holding concerns which had not previously been assessed on their securities.

With Middle West moving its headquarters, it is understood that United Light & Power, Utilities Power & Light, American Light & Traction and Standard Gas & Electric are considering moving to other states.

It has been indicated that the tax on securities held by the utilities will be contested in the courts. The utilities base their claim for exemption of the tax on the fact that they are incorporated in other states, their securities are kept in other states and therefore not subject to the tax. Appeals will not be taken until 1937 tax bills are sent out.

Utility Workers Seize Power Plants in Move to Force New Agreement

Governor Murphy acts quickly to prevent interruption of electric service as CIO strikers take over facilities of Consumers Power — Present contract extended four months — NLRB to hold election

Members of the Utility Workers Organizing Committee, a C.I.O. union, of Consumers Power Company took complete possession of company facilities in the Saginaw Valley last week and threatened another complete shutdown unless demands were met. The strikers took possession of the plants following the breakdown of negotiations with the company for a new contract.

This week, after Governor Murphy had speeded from his vacation in Florida to Detroit, hurried conferences were called, resulting in successful negotiations which called off the strike and agreement had been given to extend the present CIO contract to August 4. The present contract expired April 1.

Take over plants

Workers of the union took over plants and service stations in Flint, Saginaw and Zilwaukee and threatened to pull switches unless their demands were met by the utility. Law enforcement officers served notice on the strikers that power must not be shut off, as was the case last year when the entire Saginaw Valley was without electric service for more than 24 hours.

The agreement provided for an NLRB election to be held as soon as possible, probably within 60 days. This was requested by the local union of the International Brotherhood of Electrical Workers, an AFL affiliate, and the Independent Power Employees Association, Inc., both of which declare that the CIO union does not speak for the majority of workers.

Present wages and working conditions are to remain unchanged in the new agreement and the company agreed not to discriminate against those strikers who took possession of the plants in Saginaw, Flint, Lansing, Bay City and Zilwaukee.

Governor Murphy made it plain that disruption of service would not be tolerated. He said that the seizure of the plants was "indefensible, illegal and cannot be justified." Governor Murphy also indicated that he did not think the AFL union would call a strike since concluding the agreement with the CIO.

While the strikers remained in possession of the plants there was no disruption of service.

SETTLES POWER STRIKE—Conferees who met with Gov. Frank Murphy at Detroit this week to settle the three-day strike of the Utility Workers Organizing Committee, C.I.O., which seized control of power plants in the Saginaw Valley last week. L. to r., rear row: Elmer Stonkus, national chairman of U.W.O.C.; Maurice Sugar, union attorney; Dan E. Karn, vice-president and general manager, and M. Wilson Arthur, vice-president of Consumers Power. Front row: Monroe Causley, state chairman of U.W.O.C.; Governor Murphy, James F. Dewey, federal conciliator, and Frank G. Boyce, vice-president of Consumers Power

•

Utility Regulation Seen as Rising Cost

The keeping of "elaborately detailed" property records required by regulatory commissions, both state and federal, was seen last week as materially increasing operating expenses by H. Hobart Porter, chairman of the board of directors, American Water Works & Electric Company.

The increase of approximately $1,900,000 in gross operating revenues shown by the company and subsidiaries in 1937 was more than offset by a $3,200,000 increase in expenses, he stated. Approximately $1,000,000 of this increase was in taxes, $700,000 in reserve for depreciation and the balance in other operating expenses.

Consolidated net income was $3,878,267, equal after preferred dividends to $1.14 a share of common, against $1.58 in 1936. Taxes, including $400,000 charged to other accounts, totaled $7,600,000, equivalent to $3.24 a share of common, Mr. Porter pointed out.

Net output of the electric subsidiaries in 1937 was 2,543,000,000 kw.-hr., a new record. Some 2,700 miles of rural line were constructed or contracted for during the year and more than 9,000 new rural customers added.

Major additions to the electric subsidiaries, scheduled for completion in 1938 include: A new 50,000-kw. turbogenerator at the Springdale station of West Penn Power, placed in operation the first of the year; the second of two pulverized fuel-fired boilers at Rivestille station of Monongahela West Penn Public Service, and a 30,000-kw. turbogenerator and high-pressure steam boiler in a new building at Cumberland power station of Potomac Edison.

•

Plans Fort Worth Survey

Responding to the request of Mayor W. J. Hammond and City Manager D. L. Lewis, FPC has consented to make a preliminary estimate of cost for an electric distribution system for the city of Fort Worth, Tex., and a forecast of the power requirements of that city during the next decade. The Lower Colorado River Authority has joined in the request.

The charge to Fort Worth for the investigation and report, acting Chairman Clyde L. Seavey stated, would be on the basis of actual cost to the com-

mission. The time required for this work is not expected to exceed sixty days. Fort Worth has been negotiating with the Lower Colorado River Authority for power to serve the city, according to the commission.

•

Pennsylvania Utility Adds New Facilities

Pennsylvania Power & Light Company spent $4,763,776 on its construction budget last year, as compared with $3,449,137 in 1936, according to J. S. Wise, Jr., president. Construction budget for 1938 has not been filed with the Pennsylvania Public Utility Commission, Mr. Wise stated, and figures cannot be released.

Last year the company spent $4,237,664 on distribution, against $2,831,924 in 1936. Transmission expenditures totaled $351,528, against $412,299, and generation was $174,584, against $204,914.

The company constructed 1,216 miles of rural lines, as against 956 miles in 1936. There were 75,910 rural customers being served, as against 63,766 during 1936.

In appliance sales Pennsylvania Power & Light sold a total of 33,120 electrical appliances, as against 40,138 in 1936. The sales included 2,812 electric ranges, against 3,084 in 1936, a total of 3,580 refrigerators, against 3,588, 854 electric water heaters, against 776, and a total of 25,874 miscellaneous electrical appliances, against 32,690 in 1936.

Capital Gains Tax Eased to Aid Utilities to Revamp Systems

Senate finance committee approves exemption after SEC Chairman Douglas says it is unfair to collect a tax on forced transfers — Electric Bond & Share and other companies register under utility act

Easing of the heavy burden of taxation which would exempt from taxable income capital gains or losses accruing from dissolution of utility holding companies is expected to pave the way for early simplification of utility holding company systems under the provisions of the utility act.

Last week the Senate finance committee, with the indorsement of Chairman William O. Douglas of the SEC, wrote into the tax revision bill a feature exempting gains resulting from reformation of the utility industry. Mr. Douglas had told the committee that such a procedure would be in fairness to stockholders.

Electric Bond & Share Company, which had challenged the constitutionality of the utility act, filed registration this week with the SEC in accordance with the decision of the Supreme Court. The other affiliated holding companies of Bond & Share are preparing registration statements.

Tax is unfair

"Since the government, in effect, is requiring collapse of the intermediary and unnecessary holding companies," Mr. Douglas declared, "it is unfair in my opinion to at the same time sit there and collect a tax as the result of those transfers. It is too much like pointing a gun at those companies and requiring them to pay these taxes."

The effect of the tax revision is to allow the utility companies to consolidate their properties, according to the utility act provisions, without having to pay a high tax. It would also apply when properties are liquidated or partially liquidated between the time SEC issues orders under the "death sentence" and January 1, 1940, the deadline as written in the act.

Mr. Douglas said that the "death sentence" of the utility act is a misnomer. "What it really means is a regrouping of companies for revitalizing purposes. It will mean the transfer of properties from one system to another."

It was explained by Mr. Douglas that there were two methods of complying with this section: the voluntary method, by which holding companies present plans to change their structures "under their own motive power," and the method under which the SEC forces the company to act.

"In essence even the voluntary plan

E.E.I. SALES MEET—More aggressive selling was seen by utility leaders gathered last week at Chicago as a key to opening new sources of electric use. More than 500 representatives attended. Top l. to r.—Davis M. DeBard, Stone & Webster Service, and C. A. Eastman, Ebasco Services. Lower, l. to r.—M. E. Skinner, Buffalo, Niagara & Eastern Power; Al Fish, Lindemann & Hoverson; F. J. Simpson, Hurley Machine; F. H. McCullough, Kansas Gas & Electric; Art Grove, Edison General Electric Appliance, and C. A. Collier, Georgia Power.

will be compulsory," he said, "and since the government in effect is requiring the collapse of these intermediary companies it is unfair, in my opinion, to at the same time collect a tax as the result of those transfers."

More utilities register

Since the Supreme Court upheld the registration provisions of the utility more than two-thirds of the electric utility industry has registered with the SEC.

The following companies have acted:

Standard Gas & Electric Company, as well as two of its subsidiaries, the Northern States Power Company of Delaware and the Louisville Gas & Electric Company, have registered with the SEC.

Commonwealth Utilities Corporation and Susquehanna Utilities Company, subsidiaries of United Gas Improvement, have registered.

Associated Gas & Electric holding company units, including Associated Electric, Southeastern Electric & Gas, General Gas & Electric, New York-Pennsylvania-New Jersey Utilities, Associated Gas & Electric Corporation, Eastern Power, Northeastern Water Companies, Inc., Central U. S. Utilities, and Keystone Utilities, Inc. Associated Utilities Corporation, another member of the Associated System, has filed an application for an order declaring it not to be a holding company.

Central Hudson Gas & Electric has asked for an order declaring it not to be a subsidiary of United Corporation.

Standard Gas & Electric has been given permission by Judge John P. Nields of Wilmington, Del., to register with the SEC.

Others registered include:

American States Utilities Corporation, Wilmington, Del.; American Gas & Power, Community Gas & Power, Central Public Utility and its subsidiary Consolidated Electric & Gas, Philadelphia Electric Power.

Consolidated Electric & Gas filed applications for exemption from the law of Islands Gas & Electric, Carleton Electric Company Ltd., Woodstock Electric Railway, Light & Power Company, Ltd., and Maine & New Brunswick Electrical Power Company, Ltd.

•

Platte Seeks Another Loan

Application has been made by the Platte Valley Public Power and Irrigation District, North Platte, Neb., for an additional WPA loan of $1,061,000 for additional work on the hydroelectric power, transmission and irrigation project in the Platte Valley district. Up to the present time $10,210,000 has been secured through federal aid for this development, of which $2,850,000 represents an outright grant. The proposed additional loan will bring the investment to $11,226,000.

•

Plan $5,000,000 Plant

Pacific Gas & Electric has filed application with the California Railroad Commission to construct a $5,000,000 plant to serve the refinery at Oleum of Union Oil Company of California.

Utility's Construction Totals $117,000,000

In the ten years from 1927 to 1937 Philadelphia Electric Company spent $117,000,000 for additions and betterments to its electric, gas and steam properties, according to William H. Taylor, president.

Calling attention to the current public interest in utility expansion and construction from the standpoint of aiding business recovery, Mr. Taylor added: "These expenditures represent a major construction program which is a sizable contribution to the business activity of any community."

Principal electrical improvement under way at present is the modernization program at Schuylkill generating station, which includes installation of a new high-pressure 50,000-kw. turbo-generator unit and two high-pressure boilers. On completion the station will have an estimated capacity of 179,000 kw.

During 1937 electric sales of the system totaled 3,415,762,140 kw.-hr., a gain of about 7 per cent over 1936; electric revenues amounted to $62,229,980, an increase of about 4 per cent. At the end of the year 704,161 customers were receiving electric service, an increase of about 3 per cent. Net income for 1937 was $21,751,248, a gain of about 1 per cent over 1936.

•

Consolidated Seeks High Court Review

Consolidated Edison Company of New York, Inc., and six affiliated companies appealed to the U. S. Supreme Court from a Federal Circuit Court decision that they were subject to the National Labor Relations Act. The companies contended all their activities were within New York State and that the Circuit Court "based its decision chiefly on the fact that the petitioners supply service to some consumers who, in turn, engage in interstate commerce."

The litigation grew out of a complaint in May, 1937, to the National Labor Relations Board by the United Electrical and Radio Workers of America, a CIO affiliate, that the companies had discriminated against it and had discharged workers for union activities. The companies said they had announced a month earlier an agreement to enter into collective bargaining contracts with the International Brotherhood of Electrical Workers, an AFL affiliate. The Federal Circuit Court of New York upheld the action of the board in ordering, among other things, reinstatement of six employees found to have been dismissed because of union activities.

The petition said that if the decision was upheld, "then rare is the public utility company anywhere in the United States which will not be brought under the jurisdiction of the national board and state jurisdiction will cease to exist."

•

Commission Approves New Service Contract

Division of Public Utilities of Rhode Island has approved, after hearings, the proposed service contract between Newport (R.I.) Electric Corporation and the Central Service Corporation of Chicago. Copies of the contract had been filed with the Commission on February 24, and hearings were held March 21.

"The Division being of the opinion," the order states, "that the provisions of the proposed contract with The Central Service Corporation, with certain amendments which the parties at interest readily agreed to, will be in the interest of the public. Therefore, the Division approves of the contract."

Newport Electric Corporation, a subsidiary of United Power & Light Corporation, had operated under a service contract between the two corporations. After United went into a trusteeship, court orders cancelled previously existing service contracts with subsidiaries and made provision for contracts with Central Service Corporation.

William P. Sheffield appeared before the Rhode Island commission for the Newport company and presented only two witnesses, George W. Michael, manager of the Newport company, and D. C. Green, president Central Service Corporation.

•

Newport Electric to Seek Appeal to Borrow Funds

The appeal of the Newport Electric Corporation to the Supreme Court of Rhode Island from an adverse decision of the state division of public utilities on the company's request for permission to borrow $442,000 to finance generating plant improvements has been withdrawn.

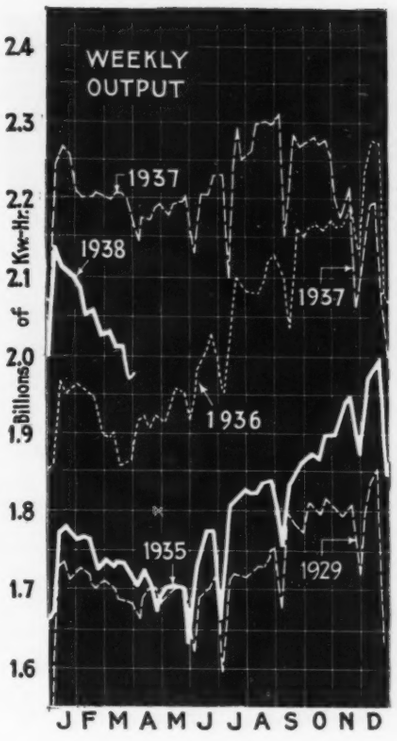
At the hearing before the division it was stated that the company sought to borrow $300,000 from the Utilities Power & Light Corporation, Ltd., of Canada and to execute serial notes for $142,000 with the Westinghouse company. It was contended that 97 per cent of the cost of the extension had already been paid, and the company's plan was attacked on the ground that the scheme of financing was not shown to be necessary.

Output Advances Slightly

Rise reduces loss from 1937 to 7.8%—Still 6% over 1936—One region above year ago

Rising somewhat from the preceding week to 1,978,753,000 kw.-hr., as against a decline a year ago, the energy output of the electric light and power industry during the week ended April 2 narrowed the deficiency, compared with 1937, to 7.8 per cent. With one slight exception this was the closest approach to last year's operations since the latter part of February, according to statistics reported by the Edison Electric Institute. The lead over 1936 remains at 6 per cent.

For the first time since the beginning of 1938 one region, the Middle Atlantic, shows a gain over 1937. The Central Industrial and New England states are still conspicuously low, but both show an advance. Also, their losses from 1937 were exceeded by their gains in the latter year over 1936. The loss of 23 per cent in the Mountain states, against a gain of nearly 33 per cent last year, also leaves a favorable balance over 1936. With the exception of the Mountain states every region made a better showing than in the two preceding weeks.



Weekly Output, Millions of Kw-Hr.

1938	1937	1936
Apr. 2..1,979	Apr. 3..2,147	Mar. 28..1,867
Mar. 26..1,975	Mar. 27..2,200	Mar. 21..1,862
Mar. 19..2,018	Mar. 20..2,211	Mar. 14..1,901
Mar. 12..2,015	Mar. 13..2,213	Mar. 7..1,893
Mar. 5..2,035	Mar. 6..2,200	Feb. 29..1,903
Feb. 26..2,031	Feb. 27..2,207	Feb. 22..1,942
Feb. 19..2,059	Feb. 20..2,212	Feb. 15..1,950

Per Cent Change from Previous Year

Region	Week Ending Apr. 2	Mar. 26	Mar. 19
New England	−12.2	−13.4	−12.8
Middle Atlantic	+ 0.5	− 5.6	− 2.8
Central Industrial	−15.2	−17.3	−15.6
West Central	− 1.7	− 5.3	− 7.5
Southern States	− 4.7	− 6.4	− 5.1
Rocky Mountain	−23.0	−19.0	−18.1
Pacific	− 2.2	− 4.9	− 0.9
United States	− 7.8	−10.2	− 9.0

Electricity Output Off 10% in February

Production of electricity for public use in the United States totaled 116,740,000,000 kw.-hr. for the year ended February 28, 1938, an increase of 6 per cent over the previous year, according to the Federal Power Commission.

Total production in February was 8,439,000,000 kw.-hr., a decrease of 9.6 per cent as compared with January and a decrease of 6 per cent compared with February last year. The decrease for February against January was mainly in the Eastern and East North Central States, although Tennessee showed the greatest decrease, 24 per cent. Rhode Island showed the largest increase over the previous month, 16.6 per cent.

These data do not include 267,491,000 kw.-hr. produced in February, 1938, by electrified railways and railroads and certain state, federal and other plants not producing electricity for public use.

The total stock of coal on hand at electric utility power plants on March 1, 1938, was 9,997,980 tons, a decrease of 3.6 per cent compared with February 1 and an increase of 11.2 per cent over March 1 last year. During February electric utility power plants consumed approximately 3,021,267 net tons of coal, a decrease of about 14.5 per cent from the previous month.

Exclusive of international transfers, a total of 1,694,964,000 kw.-hr. was reported as crossing state lines. In many cases exports and imports, while large, approximately balanced, indicating that much of the energy crossing state lines was for interchange. Among the exceptions: Vermont, generated 64,859,000 kw.-hr., imported 7,766,000 and exported 52,197,000; Maryland, generated 197,504,000 kw.-hr., imported 151,658,000 and exported 211,691,000; Missouri, generated 122,688,000 kw.-hr., imported 108,595,000 and exported 29,793,000; Nevada, generated 122,963,000 kw.-hr., imported 14,610,000 and exported 126,775,000; California, generated 635,479,000 kw.-hr., imported 126,775,000 and exported 4,499,000.

•

New England Power Announces Wage Cut

Effective April 1, 1938, the salaries of all officers and employees of the member companies of the New England Power Association receiving in excess of $3,000 per year were reduced in amounts ranging from 7½ to 12½ per cent, according to Frank D. Comerford, chairman of the board. No action is being taken at this time to reduce salaries or wages of employees receiving $3,000 or less per year.

In making the announcement, Mr. Comerford declared no improvement in the primary production of electricity in New England is yet apparent that would lead to expectation of better business in the near future. He pointed out that for the week ended March 19, 1938, primary production of electricity for the association, exclusive of sales to the Boston Edison Co., was about 18 per cent below the corresponding week last year and added that this showing was less favorable than the comparison of preceding weeks.

The salary reduction is coincident with a 33⅓ per cent reduction in the preferred dividend payable April 1.

•

Depreciation Shown by Jamestown Plant

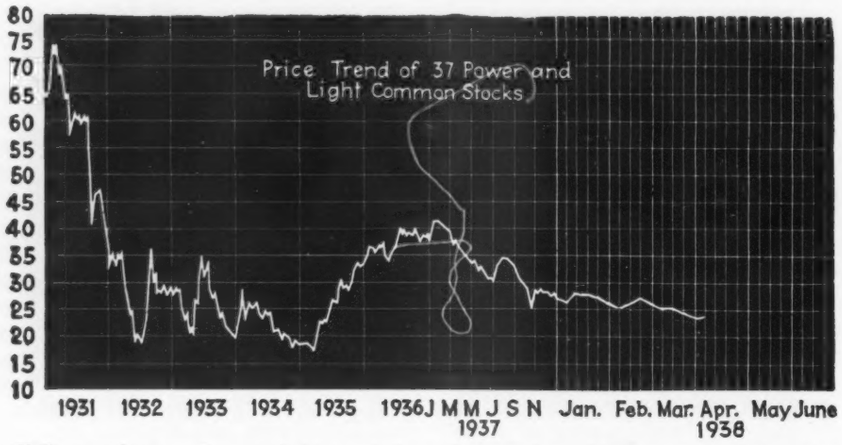
In reporting the 1937 results of the Jamestown, N. Y., municipal plant in the March 26 issue of ELECTRICAL WORLD, mention was made that no deductions were shown for depreciation or retirement. This was in error, for while these deductions were not shown as a specific item in the comparative income account of the report, such deductions did form part of the operating expenses of $601,978 reported as a total.

In the analysis of operating expenses, as shown in the report in a breakdown of expenses, depreciation of facilities totaled $216,811.

The report showed that residential electric rates start at 3.25 cents per kw.-hr., for the first 20 kw.-hr., and scale down to 1.5 cents a kw.-hr. for all over 100 kw.-hr. for Jamestown, with a minimum monthly bill of 65 cents.

On a revised basis of assessment of property and special franchise valuation, it is estimated that taxes in 1938 will be equivalent to 12 cents a dollar of gross revenue.

Utility Stocks in Recovery Move



Utility stocks moved upward this week from the 1938 low of the previous week, when the "Electrical World" index touched the lowest point since the week ended May 25, 1935. Index this week, 23.3; previous week, 22.9; year ago, 35.4

Utilities Register SEC Applications

The following registration statements have recently been filed by utility companies with the Securities and Exchange Commission:

Fall River Electric Light Company has filed a statement covering an issue of $2,000,000 of first mortgage 3½ per cent bonds, series A, due May 1, 1968. Proceeds, with other funds, will be used to redeem on or before July 1, $2,000,000 of first mortgage 5 per cent gold bonds, series A, due July 1, 1945. The company filed an application for exemption from the necessity of filing a declaration with reference to the issue.

Hearing with reference to the application of Engineers Public Service Company, Inc., of New York, N. Y., for approval as a mutual service company has been set for April 25.

Hearing with reference to the declaration of United Light & Power Engineering & Construction Company of Chicago, Ill., relative to its organization and conduct of business as a subsidiary service company of United Light & Power Company has been set for April 29.

Electric Advisers, Inc., of New York, N. Y., has filed an application under the holding company act for approval of its organization and conduct of business as a mutual service company for certain companies in the holding company system of Cities Service Power & Light Company, a registered holding company.

SEC has made effective a declaration of the Gardner Electric Light Company, a subsidiary of the New England Power Association, covering the proposed issuance and sale of its unsecured promissory notes in the aggregate amount of $400,000 at 3 per cent, provided they are issued and sold in accordance with the declaration.

New Brunswick Power Company, New Brunswick, Canada, operating solely in Canada, has filed an application under the holding company act for exemption from the provisions of such act applicable to it as a subsidiary company of Federal Light & Traction Company and Cities Service Power & Light Company.

•

Forbids Payments on Loans

Wisconsin Public Service Commission has issued an order forbidding the Northern States Power Company, Eau Claire, Wis., to pay any interest or principal on nearly $17,000,000 in loans from its Minnesota sister company. The commission ordered the utility to turn its entire surplus of more than $1,000,000 into its depreciation reserve to help create adequate provision for rebuilding its property and to increase the yearly sum set aside for depreciation by $210,000 from the yearly $400,000 depreciation allowance now set aside each year.

•

Dividend From Surplus

Declaration by the Penn Western Gas & Electric Company covering the reduction of the par value of its common stock from $12 to $5 a share and of a partial liquidating dividend to be paid out of surplus has been approved by the SEC. The dividend is to be paid partly from the $713,328 of capital surplus created by the change of par value.

•

Stock Exchange Approved

With the approval of the Public Utility Commission, the New Jersey Power & Light Company has turned over to the New York, Pennsylvania, New Jersey Utilities, an affiliate, 55,850 shares of preferred stock of the Metropolitan Edison Company, with an estimated value of $4,312,303, in exchange for 341,350 shares of common stock of the Jersey Central Power & Light Company. Both parties to the transaction are subsidiaries of the Associated Gas & Electric Company.

•

Utility Financing Slumped in March

No major new financing was done by electric light and power companies during the month of March. The only utility of that class to enter the market was the Cumberland County Power & Light Company with an additional issue of 10,000 shares of 5½ per cent cumulative preferred stock, priced at $97 per share flat.

The only sizable issue on file with the Securities and Exchange Commission is the Consolidated Edison issue of debentures, amounting to $60,000,000. Cape & Vineyard Electric Company has pending a $1,000,000 offering and Fall River Electric Light Company a $2,000,000 issue of first mortgage bonds.

Long Island Lighting Company has been authorized by the New York Public Service Commission to issue $2,300,000 of first refunding mortgage gold bonds, series C, 4 per cent. They are to be sold not later than April 20 at not less than par and accrued interest.

•

Plans New Stock Issue

Holyoke (Mass.) Water Power Company plans to increase its capital stock to $6,000,000 and has petitioned the General Court of Massachusetts to issue $3,000,000 in new stock. Proceeds will be used for plant improvements, the purchase and installation of a new 10,000-kw. steam turbine and modern oil burner, as well as extensions to the steam-heating system.

Utilities Reports (Earnings)

	Net Income 1938	1937
*Kansas City Pwr. & Lt.	$4,369,098	$4,651,284
*Florida Pwr. & Lt.	2,055,120	1,520,266
*Texas Electric Service	1,334,239	1,375,751
*Idaho Power	1,569,585	1,153,272
*Texas Pwr. & Lt.	2,284,644	2,116,133
*Nebraska Power	1,887,297	1,785,455
*Kansas Gas & Elec.	1,293,239	1,274,933
*Minnesota Pwr. & Lt.	1,463,092	1,248,783
*Houston Ltg. & Pwr.	2,832,462	2,433,568
*Birmingham Electric	721,541	672,058
*Tennessee Pub. Serv.	489,385	352,781
*Mississippi Pwr. & Lt.	735,153	607,857

* Twelve months ended February 28.

Conference on Utility Sale Hits Stalemate

Negotiations looking toward purchase of the properties of the Tennessee Public Service Company, National Power & Light subsidiary, struck a snag recently when TVA Director David E. Lilienthal, Tennessee Public Service President Paul B. Sawyer and Knoxville Mayor W. M. Mynatt conferred in Washington.

After a lengthy conference Mr. Lilienthal declared that he doubted that negotiations for sale of the utility facilities to Knoxville could be completed. He added that the conference was stalemated by the utility's insistence that the city also buy the electric street railway system for $4,000,000.

"Neither the city nor the government is interested in going into the street railway business," Mr. Lilienthal declared. "That is the whole problem." Knoxville's original offer, made in 1934, to buy the electric facilities, exclusive of the railroad, for $6,088,000, has been rejected by the utility, Mr. Lilienthal said. This original offer was blocked by litigation of a group of preferred-stock holders of the utility.

Some hope that an agreement might be reached was expressed by Mr. Lilienthal. The whole situation is not hopeless, but "very much in doubt." This was disputed by Mr. Sawyer, who said that "progress was made" and that there will be future discussion.

•

New England Industry to Survey Equipment

Increasing consciousness of the part modern equipment and methods play in competitive industry is behind an inquiry launched last week under the auspices of the New England Council and the Engineering Societies of New England, Inc. The fitness of about 2,500 plants representing 200 industries to meet their business rivals elsewhere in the country on even terms is being investigated.

The inquiry, which is confidential, covers the level of present production costs as influenced by wage rates, raw material prices, material-handling costs, fitness of machinery for particular service, costs of maintenance, increasing output and quality of product by better lighting, use of depreciation reserves for modernization, and replacement of obsolescent machinery by the latest designs.

As to New England plants, the inquiry arose from a recent survey which indicated that 63 per cent of all equipment in that section was at least ten years old. Emphasis upon its importance is given by reports that the steel industry plans $165,000,000 for new equipment this year, and that if present plans are carried out companies in the Detroit area may spend $65,000,000 for modernization.

Co-operating organizations also include the Engineering Society of Western Massachusetts, Hartford Engineers Club, Maine Association of Engineers and Providence Engineering Society. Heading the inquiry are Gustavus J. Esselen, chairman committee on industrial co-operation, Engineering Societies of New England, Inc., and Richard W. Sulloway, chairman industrial committee New England Council.

•

Associated Gas Units Aid Industry Growth

Employment of 17,911 persons was created by the location of new industries last year in areas served by the Associated Gas & Electric System and by the expansion of concerns already established in the areas, according to report of the industrial development division of the Associated System. It was reported that this was offset to some extent by the loss of 94 industries, chiefly through liquidation, throwing 5,180 persons out of work. The net gain was 12,731 new jobs.

The industrial division, which co-operates with Associated operating companies and with civic groups in helping to develop industry, reported that 272 new industrial concerns located in the areas served by the system. Of these, there were 79 producers of durable goods and 193 producers of consumers' goods. There were also 339 industrial firms which expanded their operations. It was reported that there was a net gain of $920,489 in additional estimated gas and electric annual revenue.

•

Mansfield Bill Reported

The House rivers and harbors committee reported last week with two minor amendments the bill it agreed upon recently, trimming President Roosevelt's proposal for "seven TVA's" to a plan for an advisory national resources development board. One amendment would abolish the present National Resources Board, which President Roosevelt set up by executive order; the other provides that if the proposed board appoint employees outside of civil service they receive pay no higher than the civil service scale for comparable work.

Portland Utility Plans Dealer Sales Drive

Under its new dealer co-operative merchandising program, Portland General Electric Company outlined to more than 300 dealers and their salesmen last week plans for an intensive water heater sales drive. The campaign is the first under the new set-up.

Portland General Electric is retiring from the sale of small appliances in practically all districts, limiting activity to ranges, water heaters, refrigerators and air heaters. The utility plans sales training classes, intensified market development advertising, tie-in type of advertising, and placing of the company's home service staff at the disposal of dealers.

The water heater drive is aimed at increasing the 5,000 automatic, off-peak water heater installations now served. Primary effort will be directed at the company's 35,000 electric range customers. Nine manufacturers and 70 dealers are co-operating with the utility in the drive, which lasts three weeks from March 21.

George W. Madison, former merchandise manager of the utility, heads the new activity as dealer promotion manager.

•

Would License Engineers in District of Columbia

A bill requiring professional engineers practicing within the District of Columbia to be licensed was introduced last week by Senator King of Utah. Before being granted a license as a professional engineer, the applicant would be required to certify under oath that he will receive no profit from the practice of his profession except his usual salary or fee; otherwise a modified license will be issued omitting the word "professional." Licenses are to be granted only for the specific field in which the applicant is qualified.

The usual grandfather clause is included, permitting those practicing in the district at the time of enactment to be licensed without examination, and this privilege is extended indefinitely for those persons now in the service of the federal government who may desire to enter professional practice at some future date.

•

Plans Meeting in Chicago

The National Industrial Service Association will hold its annual convention in Chicago at the Palmer House April 25-27. C. A. Sievert, Sievert Electric Company, Chicago, is secretary of that association and convention chairman.

Utility Sales Topic of Oregon Meeting

Further analysis of the cost of selling such appliances as ranges was urged recently by E. E. Walker, at the anual meeting of the Business Development Section of the Northwestern Electric Light and Power Association in Medford, Ore.

Mr. Walker, chairman of the home modernization committee, added that trial plans were no longer needed on ranges, his committees reported, but on water heaters such plans might help "to live down a certain amount of indifferent service." He told of a schedule of trade-in values for appliances, developed along automotive lines, which he declared would help meet a serious problem.

In kitchen planning better correlation of the other crafts and services with the electric end of the job and better space arrangements in kitchen layouts were seen by Mr. Walker as most important present needs. Whether a utility should or should not merchandise remained a debated subject, he reported, adding that a happy medium between the extreme opinions on dealer co-operation has still to be found.

Stresses selling

The importance of selling commercial cooking was stressed by O. C. Mayer, who said: "If you miss selling a lighting job, you can come back next week or next month and perhaps sell it. But if you miss selling a commercial cooking installation, it may be ten years before you will have another chance to sell that customer." E. C. Branch, of the industrial power and heating committee, asked for uniform data sheets and cautioned that new types of Diesel engines are being introduced.

Rural sales committee discussion included the description of an interesting region in the Mountain States Power Company territory where irrigating is done despite rainfall of from 72 to 96 in. a year. W. R. Newmyer, chairman of the committee, briefly mentioned an air-conditioning job recently sold to a chicken ranch for the brooder house.

M. L. Cummings, chairman of the advertising committee, told of California Oregon Power Company campaigns in which fast results, to selected prospects, through aggressive selling, had been necessary and had resulted in an average consumption of more than 2,000 kw.-hr. Mr. Cummings recommended more effort to merchandise company advertising to its own employees, a systematic plan for exchanging advertising copy between companies, and a further use of radio advertising, especially in small rural towns and communities.

In the closing address George C. Tenney, editor *Electrical West*, held that a better human relationship within the industry would revitalize morale and reinspire leadership.

California Oregon Power Company was host to the meeting, for which was reported an attendance of 200.

Meetings

Midwest Power Conference—La Salle Hotel, Chicago, Ill., April 13-15. L. E. Grinter, Dean, Graduate Division, Armour Institute of Technology, Chicago, Ill.

Arkansas Utilities Association—Annual convention, Eastman Hotel, Hot Springs, Ark., April 18-19.

American Chemical Society — Semi-annual meeting, Dallas, Tex., April 18-21.

Greater New York Safety Council—Annual convention, Hotel Astor, New York, April 19-21. Julien H. Harvey, executive vice-president, 60 East 42nd Street, New York, N. Y.

Missouri Association of Public Utilities—Annual convention, Jefferson Hotel, St. Louis, Mo., April 20-22. Jesse Blythe, assistant secretary, Merchants Bank Bldg., Jefferson City, Mo.

Northwest Electric Light and Power Association — Annual meeting, engineering and operation section, Vancouver, B. C., April 20-23. Berkeley Snow, executive secretary, 707 Spalding Bldg., Portland, Ore.

Southeastern Electric Exchange — Annual conference, Edgewater Gulf Hotel, Biloxi, Miss., April 21-23. John Talley, executive secretary, 308 Haas-Howell Building Atlanta, Ga.

Electrochemical Society — Spring meeting, Savannah, Ga., April 27-30. Dr. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Association of Iron and Steel Engineers—Annual spring conference, Baltimore, Md., April 28-29. Brent Wiley, managing director, Empire Building, Pittsburgh, Pa.

Maryland Utilities Association — Annual meeting, Lord Baltimore Hotel, Baltimore, Md., April 29. E. J. Roche, secretary, 55 E. Washington St., Hagerstown, Md.

Edison Electric Institute—Engineering committees meetings, Edgewater Beach Hotel, Chicago, Ill., May 2-5. Bernard F. Weadock, managing director, 420 Lexington Avenue, New York, N. Y.

National Fire Protection Association — Annual meeting, Atlantic City, N. J., May 9-13. A. R. Small, 207 East Ohio St., Chicago, Ill.

National Electrical Manufacturers Association—Spring conference, The Homestead, Hot Springs, Va., May 15-20. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

American Institute of Electrical Engineers—Northeastern district meeting, Lenox, Mass., May 18-20. H. H. Henline, national secretary, 33 West 39th St., New York.

National Electrical Wholesalers Association—Annual convention, The Homestead, Hot Springs, Va., May 22-26. Alfred Byers, secretary, 165 Broadway, New York, N. Y.

Censor Threat Seen in Commission Order

A possible censorship threat to Wisconsin utility advertising was seen this week in a statement accompanying a state-wide questionnaire sent out by the Wisconsin Public Service Commission requesting utility companies to report funds spent in 1937 for advertising and pubilicity.

Headed "Wisconsin utilities propaganda. How handled? What cost?" the order asked the utilities to specify the amount spent for advertising and to name the magazines and newspapers in which the advertising was placed, and also called for copies of all advertisements to be sent to the commission. "Some advertising and publicity," the order stated, "may have for its purpose objectives which make the cost not properly chargeable to operating expenses."

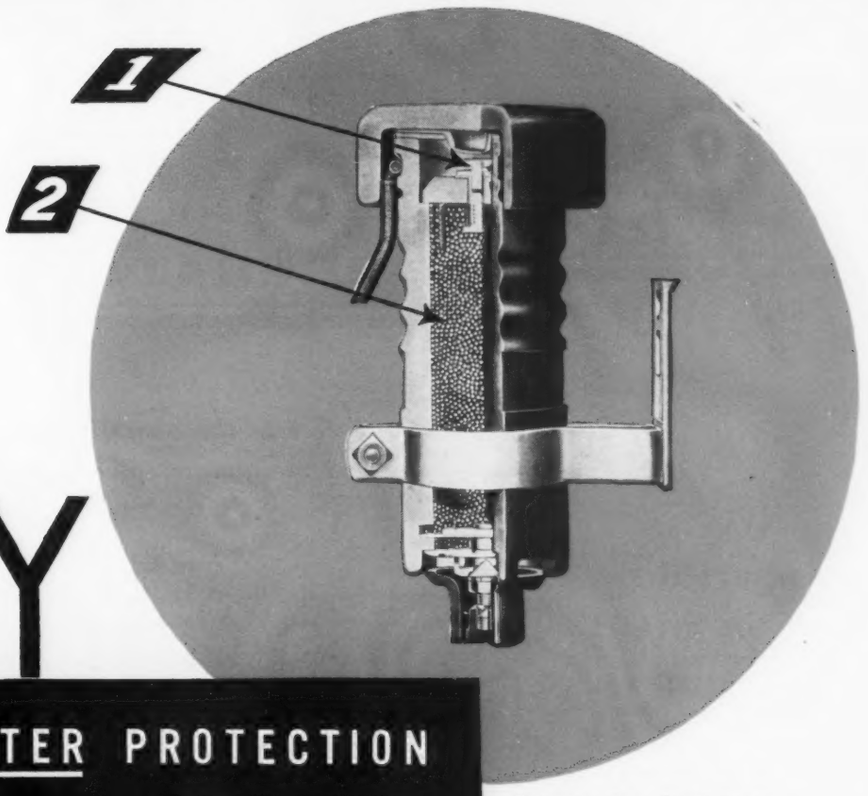
While the commission has not made public the replies to the order, A. F. Herwig, executive secretary of the Wisconsin Utilities Association, has issued a summary which indicates that Wisconsin utilities in 1937 spent 1 per cent of their gross revenues for advertising and publicity. "The advertising expenditure was far too little," Mr. Herwig said, "in comparison with the 5 to 20 per cent of the gross sales properly used by many industries for advertising."

According to Mr. Herwig, the purposes of utility advertising, as listed in the questionnaire, are: To reduce rates by promoting increased use of services; to increase sales of appliances; to prevent accidents among employees and customers; to promote friendliness between buyers and sellers; to compete with other advertisers for a fair share of money spent for modern necessities, and to emphasize that families can raise their standards of living by increased use of utility services.

•

Plant Surveys Recommended

Recommendation that all mayors of west Tennessee towns served by the West Tennessee Power & Light Company secure from their boards authority to contract with a reputable engineering firm to make a survey and an estimate of the cost of the construction of distribution systems was the principal feature of the meeting of the West Tennessee Mayors' Committee. G. C. Reid, chairman, was instructed to communicate with mayors of all towns in the area. April 11 was set as the date for the next meeting of the committee to be held in Brownsville.



WHY

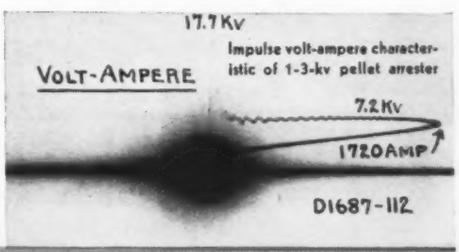
YOU GET BETTER PROTECTION WITH G-E PELLET ARRESTERS

Cutaway view showing construction features of a 1-3-kv pellet arrester

1 **THE SEALED GAP CHAMBER.** The series gap assembly is in a separate gap chamber, sealed by glazed joint and gaskets—with no dependence on shrinking or expanding waxes or compounds. This construction, exclusively a G-E feature, is the most efficient method known to the art for excluding moisture and atmospheric influences from arresters in service. This means greater reliability—*added assurance* of long life.

2 **THE PELLET VALVE COLUMN.** The pellet valve column presents an extremely low resistance to lightning-discharge current; yet after discharge it limits both magnitude and duration of power-follow current—restoring the arrester almost instantly to its normal nonconducting condition. The resistance decreases rapidly as the lightning discharge current increases—maintaining a *practically flat* volt-ampere characteristic as shown by the accompanying typical oscillogram of pellet-arrester performance. Whether it's a 1500-ampere or 5000-ampere discharge current, the pellet arrester holds a lower level of stress on your transformers—which means *better* protection.

3 **PROVED DISCHARGE CAPABILITIES.** Actual field measurements of discharge currents through distribution lightning arresters have proved that pellet arresters in service have ample discharge capabilities. The published paper reporting these tests states . . . "in the field measurements . . . no recorded discharge resulted in failure of arrester or the protected transformer."* With both the highest and the lowest discharge currents, pellet arresters afforded *dependable* protection.



This BETTER PROTECTION and over-all serviceability are reasons why it will pay you to specify G-E pellet arresters. General Electric, Schenectady, N. Y.

*(*A.I.E.E. 1935 Transactions, page 1395; reprinted in GEA-2325*)

GENERAL ELECTRIC

330-264

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Support Riser Cable Within Steel Poles

By J. L. WHITE
Appalachian Electric Power Company, Roanoke, Va.

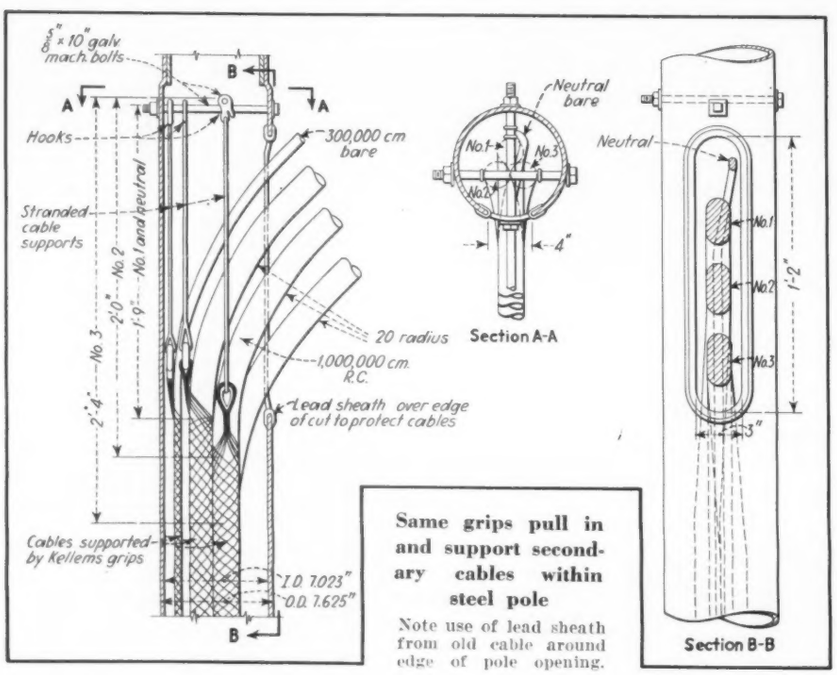
The problem of connecting underground transformers to overhead secondaries encountered in rebuilding the distribution system in downtown Roanoke, Va.,* led to the use of existing tubular steel poles for this purpose. The method of installing the transformer riser cables and supporting them within the poles is described herewith.

To take the 4-in. fiber conduit (run from the duct bells in the vault wall to the inside of the pole) holes about 14x6 in. were cut by torch in the steel pole just below the ground line. It was found that by using a combination of 45 and 90 deg. sweep-ells a satisfactory conduit job could be made between the vault and the base of the poles. A second hole, 3x14 in., was cut immediately under the secondary rack supporting the overhead secondaries. This hole faced the direction of the secondaries and allowed the risers to emerge from the pole near the secondaries to which they were connected.

Cables were measured and cut to the desired length before being pulled into the conduit. These risers consisted of threee 1,000,000-circ. mil, 600-volt cable and one bare 300,000-circ.mil neutral conductor. In pulling the cables up inside the pole Kellems woven cable grips were fastened to the four cables with the eyes of the grips connected to a ¼-in. flexible messenger that had been run from the top of the pole to the transformer vault. The risers were pulled up together inside the pole by means of a light set of blocks connected to the messenger. Once up, the grips were moved down the cable to a point where they would give proper support to the cables and hung by hooks on through-bolts on the inside of the pole. These through-bolts, shown in the illustration, were located at right angles to each other, slightly above the top opening made in the pole. No difficulty was encountered in reaching through the hole to fasten the hooks to the bolts.

Installation of transformer riser cables as described not only resulted in a neat and safe job but also resulted in other advantages not apparent when original plans were made. After some of the vaults were in service an experiment was made with cigarette smoke and it was found that a considerable amount of air seemed to act as a chimney and improved the air circulation in the vault and around the riser cables.

* See article in ELECTRICAL WORLD, August 28, 1937, page 29.



Same grips pull in and support secondary cables within steel pole

Note use of lead sheath from old cable around edge of pole opening.

Lamp Bank Test for Oxide Film Arresters

Probably no other testing device has such a long and honorable record of useful service as the simple pair of test prods with one or more lamps in series. Continually this gadget is found in different forms

CONSIDER

WHAT THE UNIT SUBSTATION SAVES

G-E unit substation installed by a New England utility

REAL ESTATE—You save in real estate and taxes because the unit substation is compact and self-contained, having small land requirements, and needing no buildings.

SYSTEM INVESTMENT—You save large system investment because capacity can be added in small increments. You save detail station layout costs because unit substations are shipped assembled and can readily be duplicated.

INSTALLATION COSTS—Time required for installation is a matter of hours instead of weeks because you simply set the units in place and connect the cables.

AND IT'S FLEXIBLE—The unit substation can be moved quickly and inexpensively to new locations should a shift in the load center demand a change.

Write to the nearest G-E office or General Electric, Dept. 6E-201, Schenectady, N.Y., for complete information on these attractive unit substations which can be placed where open structures would be undesirable or prohibitive.

310-22

GENERAL ELECTRIC

for different purposes. As, for instance the one that proved so effective at the Page Avenue substation of the Union Electric Company of Missouri, St. Louis, that now it is in almost constant demand all over the system.

This particular lamp bank is used for checking the condition of oxide film arrestrs. If the arrester is in good shape, the breakdown potential between adjacent disks should be of the order of 400 volts. Obviously the test voltage applied should be below the breakdown potential, but not so much lower that the test will discover only the very poorest sections in the arrester pile. The test voltage should be pretty close to the critical potential; that is, in the range of 440 rather than of 220 or 110 volts.

Therefore this particular lamp bank assembly includes a small air-cooled transformer, 110/440 volts, that can be plugged into any convenient outlet. Eight 220-volt, 100-watt lamps are used, two in series and the four pairs in multiple. This gives about two amperes capacity in the test circuit. The comparatively high test voltage is not normally handled hot. The test connections are made to the edge of the disks and energy applied by closing a switch in the 440-volt circuit.

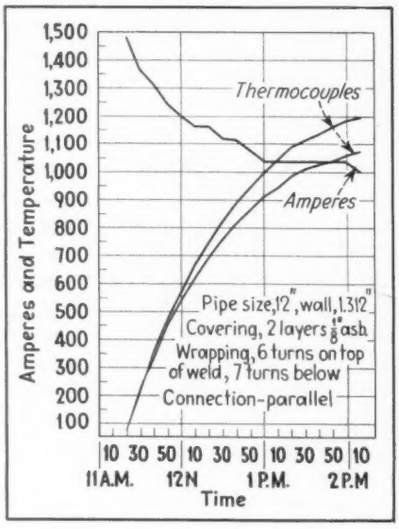
•

Preheat Welds in High-Pressure Pipe

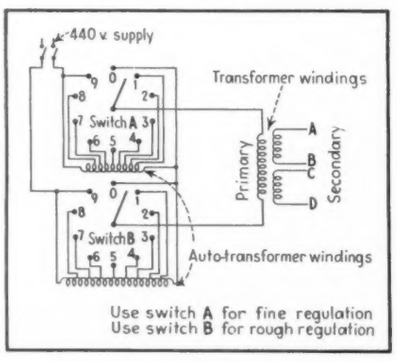
At the Essex generating station of the Public Service Electric & Gas Company a novel method has been developed for preheating and stress relieving welds in the 1,200-lb., 950-deg. steam piping.

Prior to the welding operation several turns of conductor wound about the pipe on both sides of the weld are connected to the secondary of a special 440/30-volt, 36-kva. heating transformer. Currents induced in the pipe by the coil quickly raise its temperature to about 500 deg.; for a 12-in. pipe $1\frac{3}{8}$ in. thick usually 30 to 45 minutes is required to reach 500 deg. During the first few minutes currents as high as 1,200 amp. flow in the coil at 30 volts. Then as the pipe heats up the current falls off to about 800 amp. When the temperature approaches the desired level the current is regulated to hold the desired temperature by adjusting auto-transformers in the primary circuit of the heating transformer. The usual voltage across the heating coil is between 15 and 30.

Arrangement of induction heating coils adjacent to welds in vertical piping



Induction heating brings 12-in. pipe to 1,200 deg. in 2 hours and 50 minutes



Secondary voltages from 0 to 30 for weld preheating obtained in small steps by auto-transformers in primary of a special heating transformer

Voltage supplied to the heating coil is adjusted to maintain 400 to 500 deg. about 3 in. from the weld. Temperature is measured by thermocouples in $\frac{1}{4}$-in. tubes tack welded to the pipe and peened to close contact with the metal. The temperature is held above 400 deg. F. until the weld is completed. If welding is discontinued over holidays or weekends the temperature of the pipe is kept up until welding is again resumed and the specific weld is completed. Upon completion the temperature of the weld area, six times the pipe thickness on both sides of the weld, is immediately raised to 1,200 deg. and held one hour for each inch of pipe thickness. Temperature is then gradually lowered at a rate not faster than 400 deg. per hour between 1,100 and 600 deg. The time-temperature curve of a typical pipe is shown.

Coils around the pipe consist of four to ten turns of bare 500,000-circ.mil conductor applied on top of two layers of $\frac{1}{8}$-in. asbestos paper. Entire coil is wrapped with 3-in. asbestos tape to prevent short circuiting between coils resulting from flying chips or other cause. Number of turns of conductor on each side of the weld is varied to compensate for increased conduction losses in the vicinity of valves and other massive fittings. About sixteen heating transformers made by the Electric Arc Cutting & Welding Company of Newark are in use at Essex station.

•

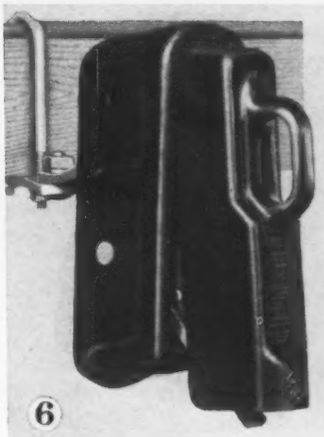
Transformer Dolly Saves Lawns, Labor

City lots laid out without alleys, while avoiding the necessity for dedicating property to the public use, make matters difficult for the utility line gangs who come around later to change transformers. People with nice lawns or vegetable gardens stoutly refuse to allow a truck to drive through their back yards to bring transformers up to poles on rear lot lines. Thus it frequently happens that a heavy transformer has to be carried by linemen from the street through the yard and up

"THE DOOR DOES IT"

for Larry the Lineman

G-E RECLOSING FUSE CUTOUTS SAVE LARRY THE LINEMAN MANY TRIPS



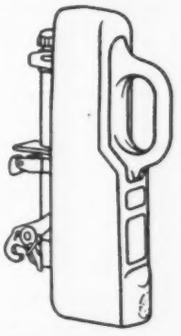
GENERAL ELECTRIC'S reclosing fuse cutout—with the reclosing feature entirely in the door—is improving service and cutting maintenance on branch circuits of many power companies. Because of the low first cost, this cutout can be installed profitably on circuits where a reclosing device has not previously been justified.

Experience has shown that, as more than 50 per cent of all faults are of a nature that will cause only one fuse to blow, this reclosing cutout will eliminate many special trips by the service truck.

CONVERT YOUR STANDARD CUTOUTS

Because the reclosing feature is entirely in the door, you can convert any G-E 50-amp enclosed indicating and drop-out fuse cutout now in service—simply by removing the present door and putting on the new reclosing door.

Ask your G-E representative for complete information, or write for Bulletin GEA-2707. Address General Electric, Schenectady, N. Y.



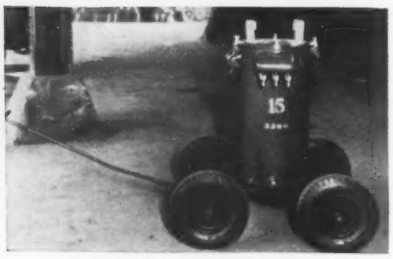
THIS IS THE DOOR that does it for Larry. It contains the reclosing feature—two fuses so arranged that the second one is automatically connected in the circuit one second after the first one blows.

Note the compactness of the G-E reclosing fuse cutout; it requires no more mounting space than a standard indicating and drop-out fuse cutout. Available in 50-amp ratings at 5000 volts and 7500/12,500 gr-Y volts.

GENERAL ELECTRIC

Filing No. 5254

340-38



Dolly carries transformers over private property

Platform 36 x 24 in., 12 in. above ground. Tires 8 x 4 in.

to the pole. And then the replaced transformer has to be carried back.

The Milwaukee Electric Railway & Light Company has a sturdy dolly cart with doughnut pneumatic tires on which a transformer or other heavy piece of equipment can be loaded and transported across the fairest lawn. To show its size and design the cart is illustrated in the accompanying picture.

•

Maintains Accurate Rotating Standards

By HARRY G. HAMMOND
Meter Standards Laboratory
Detroit Edison Company

All rotating standards—more properly termed standard watt-hour meters—used by the Detroit Edison Company are checked weekly and semi-annually.* The checks are different for the two periods and for the different kinds of instruments as appears from the following routine:

Standard Watt-Hour Meters (Alternating current, single phase). Weekly Check—Standard watt-hour meters that are checked in the standardizing laboratory are tested on 7.5 per cent load and 75 per cent load on the 5- or 10-amp. coil, 120 volts. Allowable limit of error, 0.5 per cent.

Semi-Annual Check—Standard watt-hour meters are checked on all ranges at 75 per cent load, unity power factor and 75 per cent load, 50 per cent lagging power factor. A curve on one range is taken at 100, 75, 50, 25 and 7.5 per cent load, unity power factor. Allowable limit of error, 0.5 per cent.

Standard Watt-Hour Meter Checks at Branch Offices—The 5- or 10-amp. coil, as the case may be, of each standard watt-hour meter is checked against the wall standard weekly at 10 per cent and 75 per cent loads, 120 volts. Twenty revolutions at 75 per cent load and four revolutions at 10 per cent load are the minimum number of revolutions taken.

All standard watt-hour meters are returned to the standardizing laboratory once each month. Allowable limit of error, 75 per cent load, 0.5 per cent; 10 per cent load, 1 per cent.

Wall Standards—The standard watt-hour meter that is used to check wall standards is checked monthly or before being used. Allowable limits of error, 0.3 per cent. All wall standards are checked for accuracy every two months, using the following loads: 0.5, 1.0, 4.0 and 8.0 amp., 120 volts. Allowable limit of error, 0.3 per cent, allowance being made for correction to standard watt-hour meter.

Standard Watt-Hour Meters (Direct current)—An average of two checks per week are made on the 10-amp., 120-volt range at 7.5 per cent and 75 per cent load and a monthly check at 75 per cent load on the 10-amp., 240-volt range. Test semi-annually on all current and voltage ranges at 75 per cent load. Test semi-annually on 7.5 per cent load for effect of reversed polarity. All checks are made against laboratory standard voltmeter and ammeter. Allowable limits of error, 0.5 per cent.

Standard Watt-Hour Meters (Alternating current, three phase). Weekly Check—Curves are taken at 50 per cent lag, 70 per cent lag and unity three-phase power factor, on the following loads 20 per cent, 40 per cent, 70 per cent and 90 per cent of full-load current on the 5- amp. coil at 120 volts.

Standard watt-hour meters are checked on loads corresponding to those obtained on tester's load box, namely, 7.5 and 75 per cent load at 86 per cent lagging power factor. Calibration procedure to follow outline filed in laboratory office under report No. 67, Appendix 2.†

Semi-Annual Check—Standard watt-hour meters are checked to determine the correction between ranges, by a 75 per cent load, unity power factor test on separate elements.

* See diagram of testing schedule, "Meter Department Standardization Routine," ELECTRICAL WORLD, November 6, 1937.

† This outline will appear in a later article.

• • •

Secondary Distribution Economics*

I—Identifying the Factors and Elements

By E. M. ADKINS
Jersey Central Power & Light Company,
Asbury Park, N. J.

Continuity in character of the secondary system along with higher current densities than in the primary circuits and a smaller proportion of total circuit served by each transformer facilitates a more direct economic derwation of conductor sizes, transformer sizes and transformer spacing than is usually possible with the primary. The relatively high investment per unit of load served by the secondary system also makes the derivation of average values of large significance in planning an economical secondary system.

If all elements of cost can be expressed in terms of capital to be invested, a most favorable selection of type of secondary circuit, conductor and transformer sizes, etc., can be made for the particular load density and locality characteristics. Therefore, the elements of cost bearing on economy which cover the overall capital outlay can be itemized as follows:

1. Capitalized value of secondary conductor copper loss.
2. Capitalized value of transformer copper loss.
3. Capitalized value of transformer iron loss.
4. Capital investment in secondary copper.
5. Capital investment in transformers.
6. Capitalized value of transformer operating expense per year.
7. Capital investment in primary lateral.

Conductor and transformer sizes must be determined before the capitalized value of transformer and conductor loss can be found. The above will, to facilitate comparison, best be expressed in terms of a unit of 1,000-ft. length of secondary circuit.

The derivation of equations for relating the economic and engineering characteristics in subsequent installments of this series will be based on the following constants and symbols:

V = Maximum allowable voltage drop per current-carrying conductor.
D = Secondary current per 1,000 ft. of secondary circuit.
b = Length in feet of equivalent square block.
T = Total length in feet of secondary circuit per transformer installation.
z = Effective impedance per foot of wire $= r \cos \theta + x \sin \theta$.
r = Resistance per foot of wire.
x = Reactance per foot of wire.
I = Transformer current in amperes.
E = Secondary voltage = 240 volts for single phase and 120/208 volts for three phase.
W = Total energy loss in watts per 1,000 ft. of secondary.
W_i = Watts transformer iron loss.
W_c = Watts transformer copper loss.
C_p = Cost of primary lateral per 1,000 ft.
M = Capitalized value of transformer operation expense per transformer per year.
y = Number of equivalent square blocks per transformer.
P = Thousands of feet of primary lateral per thousand feet of secondary.
k_i = Capitalized value of transformer iron loss per kw.
k_c = Capitalized value of transformer copper loss per kw.
k_s = Capitalized value of secondary conductor loss per kw.
C_s = Capital investment per 1,000 ft. secondary circuit.
C_t = Capital investment per transformer installation.

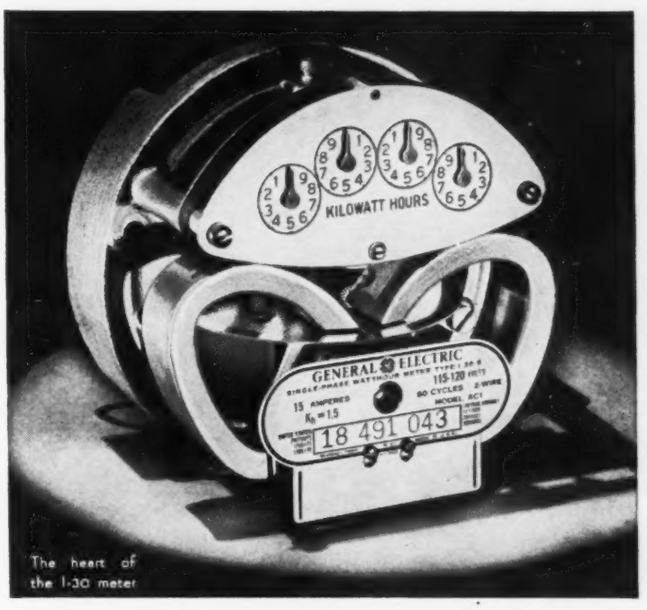
* Installment No. 1 in a series to appear in forthcoming issues of ELECTRICAL WORLD.

WIDE-LIMIT

THIS is an accurately reproduced curve of the most accurate watthour meter in existence today—the G-E wide-limit watthour meter.

It is the performance curve of the Type I-30 single-phase watthour meter rated 15 amperes, 240 volts, 3-wire. It shows that the I-30 meter has an almost straight-line characteristic between the wide-apart limits of 0.5 and 60 amperes. It also shows why this one meter is suited for both large and small single-phase loads and thus reduces inventory investment, keeps down maintenance, and protects revenue.

Investigate the advantages of making the Type I-30 (A or S) your standard. Send for Bulletin GEA-2721A, which gives details and prices; or call a G-E meter specialist. Address nearest G-E sales office or General Electric Company, Dept. 6—201, Schenectady, New York.



The heart of the I-30 meter

GENERAL ELECTRIC

400-30

PLEASE TURN MAGAZINE THIS WAY

Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Incandescent Brazing New Industrial Tool*

Development of incandescent electric carbon brazing, a new jointing technique particularly suited to production brazing in industry, is in line with the introduction of the new brazing alloys containing silver. This brazing technique, which is particularly suited to use with the new brazing alloys and fluxes, is being adopted by industry as a substitute for the older and more costly mechanical or soft solder jointing.

Essentially, the method consists of asembling the joint, clamping it between the electrodes of a pair of brazing tongs and passing electric current through the work to raise it to brazing temperature. Advantages claimed for this type of joint are: (1) It takes less time and costs less than mechanical or soft solder joints; (2) lighter sections of metal can be joined; (3) joints do not require pretinning; (4) parts can be joined close to insulation or supporting members; (5) length of joint lap can be reduced; (6) silver brazed joints, when properly made, stand up under thermal overload, vibration, corrosion and mechanical and electrical stresses.

Generally, alternating current is used for incandescent carbon brazing because of the ease of obtaining the necessary heavy current. The current is supplied to the brazing tongs directly from a transformer designed to furnish current at the desired voltage. The standard primary voltage is 220 volts, with secondary voltages ranging from 7.5 to 12.

Three types of electrodes, soft, hard and extra hard, are used. While all three are generally made from carbon and graphite, they vary considerably in their applications and advantages. The "soft" electrode has a low surface resistance, thereby practically eliminating the danger of overheating the work in spots. The

General Electric

Apply incandescent electric carbon brazing to terminals of current transformers

"hard" type has a considerably greater surface resistance than the soft electrode and, therefore, operators should be given a certain amount of training before this electrode can be used. Its major advantage lies in the fact that brazing temperature can be had with approximately 30 per cent less current. The "extra hard" electrode has the highest resistance and should be used only by skilled operators. With it brazing temperatures are had with 50% of current for soft electrodes.

* From a paper delivered before members of American Welding Society by Walter Reed, General Electric, and Leo Edelson, Handy & Harmon.

Roof Water Tank Kept from Freezing

Three thermostatically controlled electric immersion heaters totalling 17.5 kw. have been installed in the 15,000-gal. roof water tank of the General Electric Supply Corporation in New York City to insure that it will not freeze during even the most brisk winter weather. Should the tank freeze the danger of damage to it would be considerable. In addition the automatic sprinkler systems and other fire-fighting equipment in the building, which is owned by the Chesgold Holding Corporation, might be rendered ineffective.

The thermostat controlling operation of the heating units is set to operate when the temperature of the water in the tank reaches 40 deg. F. Indicative of the operation of the installation during a cold spell is the chart on page 76, showing the relation between hourly atmospheric temperature and the "on and off" period of heaters from January 15 to January 21 of this year. It is interesting to note that the heaters did not operate until one hour after the outside air temperature had recorded an average of less than 7 deg. F. over a three-hour period. The average air temperature for nineteen hours preceding the operation of the heaters was 17.6 deg. and during the 26 hours that the heaters were in operation the average temperature was 11.4 deg.

For the winter season 1937-1938 the total consumption of this installation has been 622 kw.-hr. The winter, however, has been generally accepted as a mild one in the New York area.

Among the advantages of this type of installation, aside from those al-

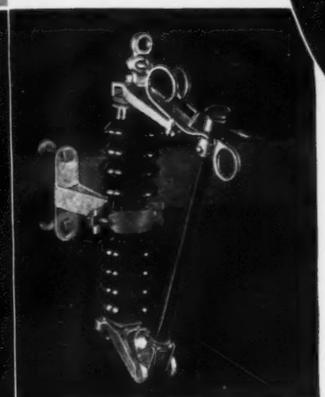
R&IE *Automatic reset* REPEATING FUSE

The New Type

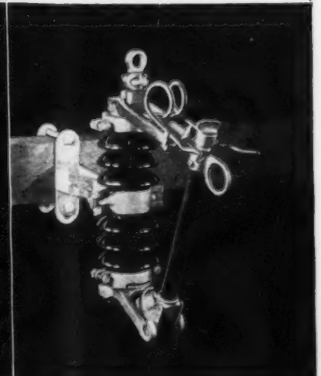
RKOT

5000 Volt.....Cat. No. 23626
7.5/12.5Y KV.. Cat. No. 23628
15,000 Volt.....Cat. No. 23630

Type KOT 100 Amp. (insert type)
5000 Volt.....Cat. No. 19861
7.5/12.5Y KV.....Cat. No. 19862
15,000 Volt.....Cat. No. 19863

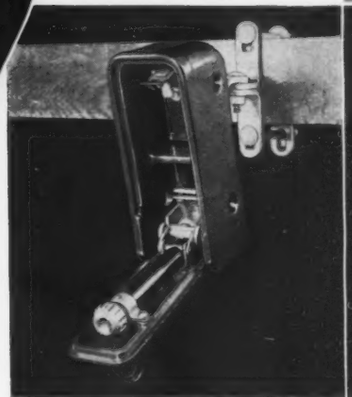


Type CKOT 100 Amp. (clamp type)
5000 Volt.....Cat. No. 20065
7.5/12.5Y KV.....Cat. No. 20066
15,000 Volt.....Cat. No. 20067

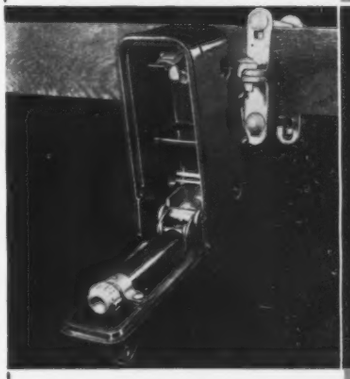


Type 2-KOT 100 Amp. (pin type)
7.5/12.5Y KV.....Cat. No. 19881
15,000 Volt.....Cat. No. 19882

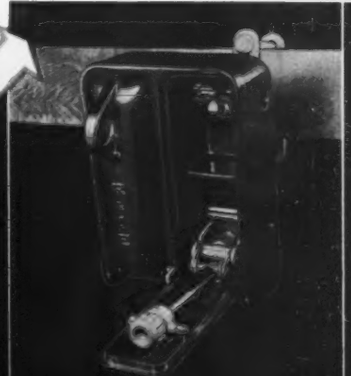
Type EKOT 5000 Volt
50 Amp.....Cat. No. 20910
100 Amp.....Cat. No. 21490
Doors interchangeable.



Type EKOT 50 Amp. 7.5/12.5Y KV. Cat. No. 21491, developed from 5KV. Cat. No. 20910, with addition of Insulator Cat. No. 21509.

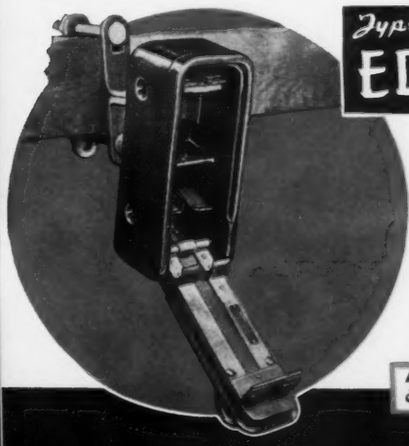


Type REKOT
5000 Volt, 50 Amp.... Cat. No. 22798
7.5/12.5Y KV, 50 A.. Cat. No. 22052
5000 V, 100 Amp.....Cat. No. 22799



A SAFE, DEPENDABLE ADDITION TO OUTDOOR DISTRIBUTION - RUGGED - POSITIVE

A desirable feature of this new R&IE repeating fuse is the automatic reset device. When the tube is closed, the transfer blade automatically resets, making it impossible to have more than one fuse in the circuit at one time. As the tube is replaced, it makes contact before transfer blade opens, preventing interruption and arcing at contacts due to the load breaking.



Type **ED** **ENCLOSED DISCONNECT**

(Three Switches in One Housing)

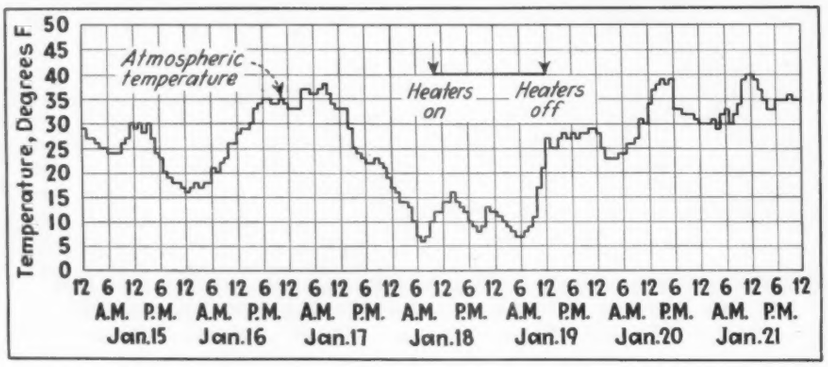
The disconnect for many purposes—Booster Transformers, Regulators, Street lighting, Current Transformer Secondaries, for cutting out small oil breakers, and many others. Safer—more economical—requires less space than single pole disconnects.

5 KV 100 Amp.....Cat. No. 22979
7.5/12.5Y KV 100 Amp. Cat. No. 22980

Any of the above may be converted into disconnects by replacing tubes with blades.

RAILWAY AND INDUSTRIAL
ENGINEERING CO. . . GREENSBURG, PENNA.

In Canada Eastern Power Devices, Ltd., Toronto



Immersion heaters keep water in roof tank above freezing

Record of "on and off" operation of 17.5 kw. of immersion units in 15,000-gal. roof tank. Compare the number of hours of heater operation with the number of hours of freezing air temperature. Data by courtesy of Consolidated Edison Company of New York, Inc.

ready listed, are: (1) Heat is required only when a prolonged cold snap affects the temperature of the water. (2) It is unnecessary to maintain steam pressure to force steam through the tank after normal working hours. (3) No attendance is required. (4) A considerable saving in fuel is realized over the accepted practice of forcing steam through the tank at intervals when the temperature of the air drops below the freezing point.

•

Redesign Sand Blast to Modernize Drive

By P. F. REICHHELM
President American Swiss File & Tool Company, Elizabeth, N. J.

Traditional belief in the efficiency of medium pressure steam in a sand blast for cleaning American-Swiss pattern files made by the American Swiss File & Tool Company, Elizabeth, N. J., was among the factors that over a period of years had influenced this company's decision to maintain a 125-kw. d.c. steam-engine-driven generator to supply its power requirements. Tests conducted by the company, with the co-operation of the test department of the Public Service Electric & Gas Company, revealed that a sand blast with compressed air at 66 lb. pressure in nozzles redesigned for air operation did as well as a former steam-actuated sand blast. We found that by increasing the pressure between 85 and 100 lb. with redesigned nozzles much better sharpening and cleaning resulted.

This discovery led the company to discard existing d.c. generating equipment, recondition the entire plant drive for purchased a.c. operation and to install a 30-hp. air compressor. In the course of the study incident to the installation of a.c. motor drive it was found that by reconditioning the plant's group drive, eliminating unnecessary line shafts, installing pivoted base motor mountings, installing ball bearings in shaft hangers, reducing the motor size on machines that had been overmotored in the d.c. installation, the addition of the 30-hp. compressor drive could be made without increasing the plant's half-hour monthly demand appreciably above its value of 84 kw. with d.c. operation.

As a result of this modernization of plant drive and the change to purchased a.c. power operation annual savings in the cost of power have been realized that will permit the investment in equipment to be paid off in about $2\frac{1}{2}$ years.

•

High Light Intensity for Newspaper Plant

An outstanding lighting installation which aims at reducing errors, improving the comfort and efficiency of employees engaged in proofreading and composing has been installed at the Alhambra *Post Advocate*, Alhambra, Calif.

For the high-bay section of the plant deep-bowl porcelain-enamel reflectors with 300-watt lamps were employed. In the low-bay section R.L.M. dome reflectors with 150-watt lamps were used. Supplementing these to raise light intensities on surfaces where exacting work is done are luminous hoods built by Light Control Company, Los Angeles. Measuring 18x36x12 in., each employs two 150-watt lamps and has a minimum brightness on the flashed opal panel at bottom of 325 ft.-lamberts. These maintain the following light intensities: Make-up tables, 35-50 ft.-candles; advertising tables, 40-60 ft.-candles; proofreader's desk, 30-40 ft.-candles.

Luminous hoods provide uniform high-intensity light on make-up tables in newspaper plant

G-E Insulating Materials help repairmen do a quick job and one that will last. A complete line of high quality materials makes it easy to do a quick job, and at the same time one that will last. G-E Insulating Materials assure you of high quality. They are the same Insulating Materials the General Electric Company uses in the manufacture of its products. The General Electric line of Insulating Materials is complete. Distributors in principal cities carry comprehensive stocks for immediate delivery.

HELP YOUR REPAIRMEN DO BETTER WORK . . . REDUCE YOUR MAINTENANCE COSTS
by specifying G-E Insulating Materials

GENERAL ELECTRIC

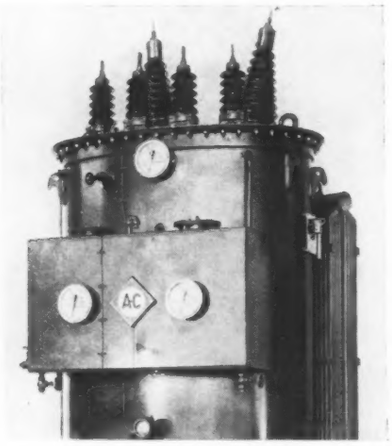
New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Oil Seals Inert Gas in Transformer

By W. C. SEALEY
Transformer Engineer, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Three 1,000-kva. transformers employing a not very common system of inert gas protection were recently installed on the system of a large West Coast utility. The system consists of a divided expansion tank welded to the side of the main tank. This expansion tank is half filled with oil and divided by a vertical partition with a hole in the bottom. The space above the oil on one side of the



Oil seals inert gas cushion in transformer

partition is connected to the gas-filled space above the oil in the transformer. The air space above the oil on the other side of the partition is connected to the atmosphere by a breather. Thus the tank forms an oil seal to maintain an inert atmosphere above oil in transformer.

Advantages of inert gas equipment, regardless of type, are twofold: (1) The transformer oil is sealed so that moisture and oxygen cannot reach it to cause deterioration; (2) an inert gas cushion is provided above the oil in the main tank so that primary explosions are cushioned to prevent damage and secondary explosions are eliminated.

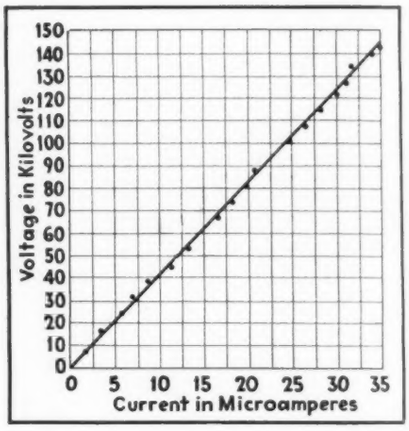
As placed in service, the inert gas (nitrogen) is forced into the space above the oil. This gas forces the oil out of the closed side of the expansion tank into the open side until the gas bubbles through the hole in the bottom of the partition and up through the oil in the open side. Pressure of the gas in the transformer tank is the algebraic sum of the atmospheric pressure and that represented by the difference in oil level on the two sides of the baffle in the explosion tank.

•

Develop Resistor for High Voltage

A new metallized resistor capable of continuous operation on voltages of the order of 5 kv. per linear inch is being closely studied by experimenters in the field of high-voltage research with an eye to determining its applicability to the measurement of high potentials encountered in surge test apparatus.

Experimental resistors have been made by the International Resistance Company, Philadelphia, for operation across 25, 50 and 75 kv. These units consist of a spirally-applied metallized element on an isolantite tube and covered with a protective coating. The resistors can be made with any resistance from $\frac{1}{4}$ to 100,000 megohms with a standard accuracy



Calibration curve for two 2,000-megohm, 50-kv. resistors connected in series for measurement of voltages up to 150 kv.

tolerance of ± 15 per cent; accuracies as close as ± 5 per cent can be obtained in special resistors. The temperature coefficient of the resistors is —0.05 per cent per deg. C rise. Energy dissipation is limited by the maximum permissible temperature rise of 75 deg. C.

Two resistance units $10\frac{1}{2}$ x $1\frac{1}{8}$ in. diameter, each having a resistance of 2,000 megohms, were incorporated in one unit and used over a period of several months in the high-voltage laboratory of an Eastern university to measure voltages of the order of 150 kv. The calibration curve for these units is shown herewith. These units were placed in a 3-in. diameter micarta cylinder and the space between the resistors and the wall filled with ceresin. A third similar resistor was tested to breakdown in air at the same laboratory. It reportedly showed good constancy up to 100 kv. Flashover along the insulator occurred at 140 kv.

The possible field of application

SPRING CALLS FOR A CROWSNEST

CAST BRONZE TRUSS ANCHOR PLATES
SELF LEVELING TOOL BOX
ADJUSTABLE LEVERS ASSURE LEVEL PLATFORM IN ANY INCLINATION
GUARD RAIL FOR PROTECTION AGAINST SLIPPING
RING BOLTS FOR SAFETY BELT
FERRULE OF SPECIAL DESIGN ELIMINATES SIDE SWAY
COLLAPSIBLE PLATFORM DROPS INTO PLACE WHEN LADDER IS EXTENDED—FOLDS WHEN LOWERED
WASHER PLATE FOR TIE ROD AND FERRULE BOLTS
HICKORY RUNGS REINFORCED WITH STEEL RODS TOP AND BOTTOM
SITKA SPRUCE—MEETING ARMY & NAVY SPECIFICATIONS

COSTS LITTLE TO BUY AND MAINTAIN AND MEETS EVERY LADDER-RIG NEED

BULLETIN 102

To definitely lighten the cost of this Spring's construction and maintenance work—use a Murray Crowsnest. Those Spring jobs of repainting lamp standards, installing new and additional ornamentals, repairs and maintenance of those now existing, can be accomplished at low cost with this expertly-built ladder-rig.

And while economy is exactly what its use means, this sturdy ladder of sound engineering design provides a safe, secure method of overcoming the hazards with which your men are confronted. The flexibility of the Murray Crowsnest is outstanding and means that "spotting" is easy—that only seconds are required to erect it in any of the hundreds of working positions.

The hundreds of its users are prepared for the seasonal rush. Let us send you Bulletin 102—it gives detailed information.

METROPOLITAN DEVICE CORP.

1250 Atlantic Ave., Brooklyn, N. Y.

MURRAY CROWSNEST

for these resistors seen at present by the manufacturers includes Van de Graaff generators, X-ray equipment, Kenotron sets, voltmeter multipliers in place of sphere gaps and resistors for portable test instruments of the type described in ELECTRICAL WORLD, February 12, 1938, page 72.

•

Harmonics May Delay Relay Operation

By

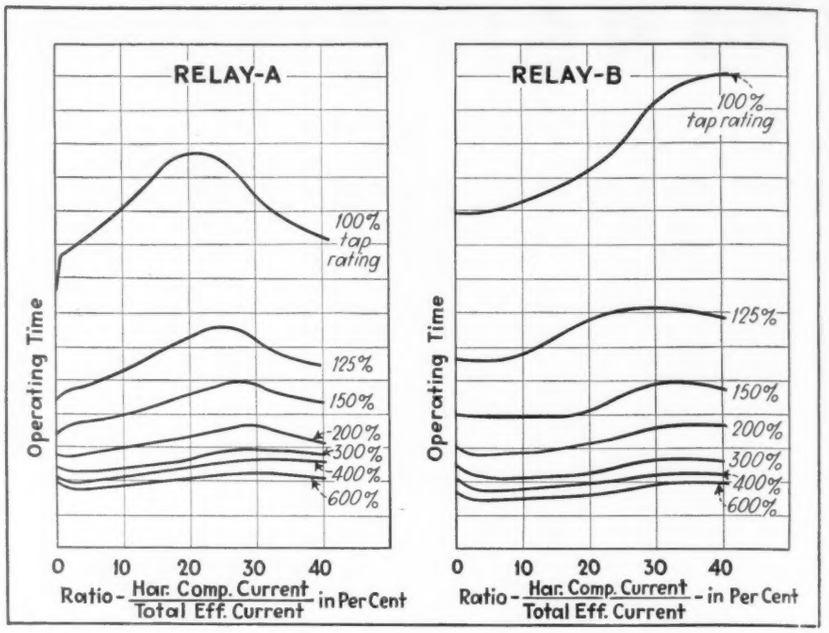
M. A. FAUCETT . . . C. A. KEENER

Electrical Engineering Department, University of Illinois, Urbana

For equal values of effective current induction relays are less quickly responsive to peak-top non-sinusoidal wave forms, usually present in system disturbances, than to flat-top non-sinusoidal or to fundamental wave forms. Maximum effects of harmonics are at low tap ratings of relays.

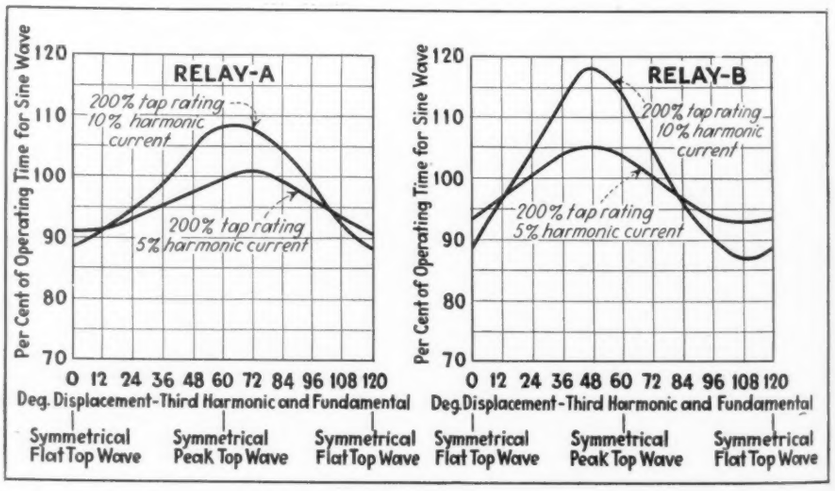
These are conclusions derived from recent tests at the University of Illinois. It appears further that in some networks the relay settings may be so close that a particular type of non-sinusoidal wave form during fault conditions will give an undesired operating sequence of relays. This is especially true if the flux density in the relay is influenced appreciably by change in wave form. However, such danger, while probably very real, is also rather remote, since the influence of non-sinusoidal wave form is reduced as the current density, and hence the flux density, is increased and since relays usually operate under heavy current densities.

The tests indicate that the time required for the operation of the relay may be as much as 10 to 15 per cent in error at currents approximately double the pick-up value, when a harmonic content of less than 10 per cent of the fundamental is present. The magnitude of the error is a function of many factors influencing the wave form. Three of the important factors controlling this error are: (1) The ratio of the effective values of harmonic content to the fundamental content, (2) the time relationship of the harmonics to the fundamental, and (3) the per cent tap rating at which the relay is operated. Both theoretical consideration and practical experience indicate that a ratio of harmonic to fundamental of one to four is the maximum to be expected in the currents which result from a fault in a network. A further probability is that the fault currents will have a peaked rather than a flat topped wave form. The graphs show the proportional effects of the three factors within their likely range of system conditions. If the network to be protected is so complex as to require very close time settings of the relays, the influence of possible harmonics in the fault currents may be sufficient to make it advisable that they be taken into account in the setting of the relays.



Harmonic magnitude has maximum effect in 20 to 30 per cent range

Tests were made to determine the effects of the magnitude of the harmonics relative to the fundamental. The harmonic content was varied from zero to 35 per cent of the fundamental and adjusted to such a time relationship with the fundamental as to give a symmetrical peaked wave form. The tests were made at various values of current for each ratio of harmonic to fundamental. These graphs show the effects on two relays of different magnetic circuit design. It will be noted that the effects of the harmonics are greatest for small values of current and that the two relays have different characteristics, especially at small current values.



Peak top wave has most effect

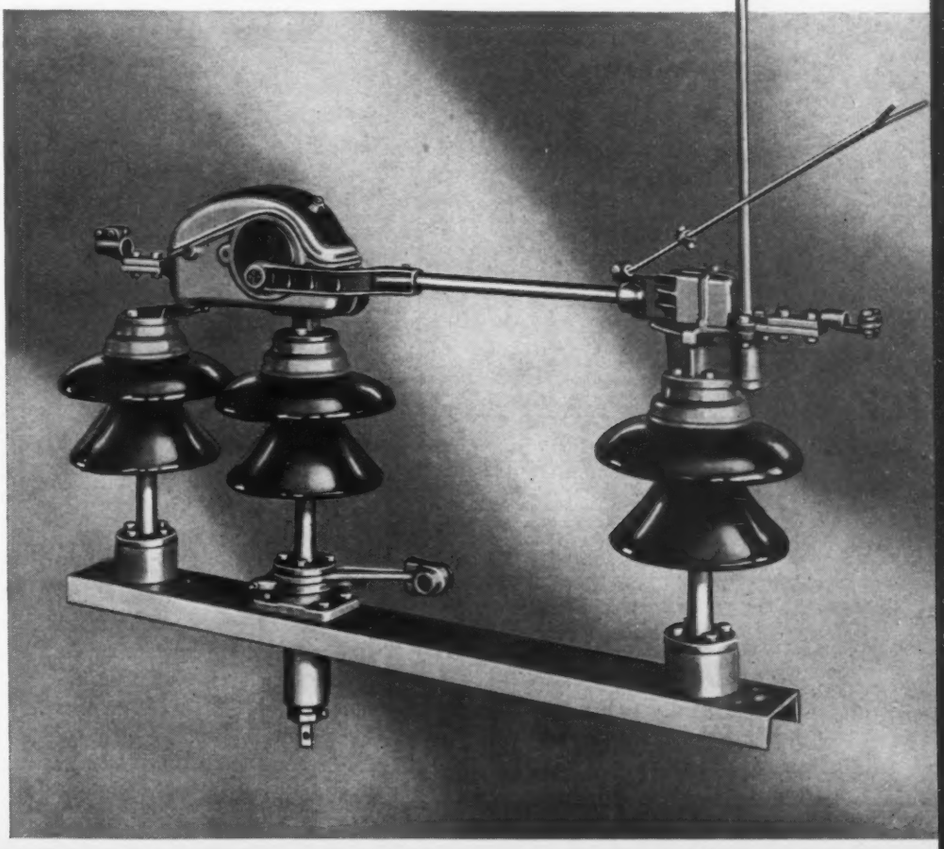
Non-sinusoidal fault currents usually have a peaked wave form and the harmonics in the test current should conform to this condition. The effect of displacement of the harmonic from the time relationship giving a symmetrically peaked wave form is shown in these graphs for the two different relays. It will be noted that the operating time is decreased as the wave form is changed from a peaked to a flat topped wave. This is probably caused by the greater maximum magnetomotive force produced by a peaked wave form of current failing to produce a proportional value of flux because of magnetic saturation. Hence a peaked wave of current cannot produce as great a torque as a flat topped wave having the same effective value.

HI-VOLTAGE
NO PROVISION FOR ADJUSTMENT
GUARANTEES MINIMUM OF ATTENTION
"THAT REMINDS ME .... DARNED IF I DIDN'T FORGET TO RENEW MY INSURANCE!"

• So simply designed and accurately machined is the operating mechanism of Hi-Voltage Air Break Switches that there is never any occasion for making adjustments in the field. In fact no *provision* for adjustment will ever be found on Hi-Voltage Equipment . . . another evidence of the more reliable, cost-freer operation we have actually *built* into Hi-Voltage Equipment. But *don't* expect to pay extra for this finer performance . . . Hi-Voltage Switches cost you no more in the beginning and will save you money ever after.

Ask for a copy of Bulletin 26.

•



HI-VOLTAGE EQUIPMENT CO.

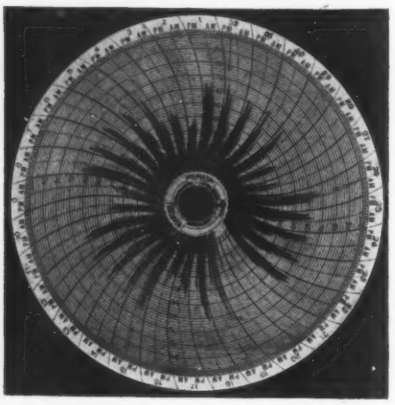
2891 EAST 79TH ST., CLEVELAND, OHIO

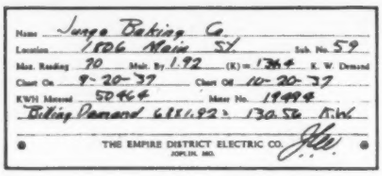
Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

Customer Gets All Billing Data

Determination of quantities on electricity bills is a mysterious operation to most customers for two reasons. One reason—and the one most frequently observed—is that the customer refuses to be bothered with learning how to figure his bill and the other is that the utility makes no effort to teach him how to do it. But no industrial power customer of the




Name Jungo Baking Co.
Location 1806 Main St. Sub. No. 59
Max. Reading 70 Mult. By 1.92 (K) = 1364 K. W. Demand
Chart On 9-20-37 Chart Off 10-20-37
KWH Metered 52464 Meter No. 19494
Billing Demand 683.92 x 130.56 K.W.
THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MO.

Demand chart and computation accompanies power bill

Empire District Electric Company, Joplin, Mo., can say that the company does not give him all the data to figure his bill if he wants to do it.

With each bill for service where a recording demand meter is used is sent a photostatic copy of the demand meter chart, from which the billing demand is taken, and on the same photostat, as appears in the accompanying illustration. are all the data showing computation of the demand. The data sticker is placed below the demand chart for the photostat before being pasted on the back of it for filing.

Rewarding Users with Lower Unit Prices

A specific example of the benefits of liberal use of electricity in the home contrasted with small consumption was presented not long ago before the Massachusetts commission by the Quincy Electric Light & Power Company. Besides demonstrating the well-understood trend toward lower unit prices for increased consumption, the exhibit reveals the step-by-step response of the progressive consumer's usage to the addition of three important appliances, viz., an electric refrigerator, oil burner and range, together with the effect of three rate reductions over a period of seven years ending with the close of 1936.

Here is a graphic portrayal of the value of domestic load building to the customer and to the utility. Fig. 1 shows the month-by-month consumption of energy for customers 1 and 2, each using about the same amount of electricity at the start. The addition of an electric refrigerator by customer 1 in 1929 not only increased his usage by about 30 kw.-hr. a month, but it "ironed out" some of the fluctuations of his demand and improved his load-factor accordingly. Customer 2 possesses no electric refrigerator, oil burner or range, using energy for lighting and minor applications. In 1931 the oil burner of customer 1 was added, carrying the consumption upward in the win-

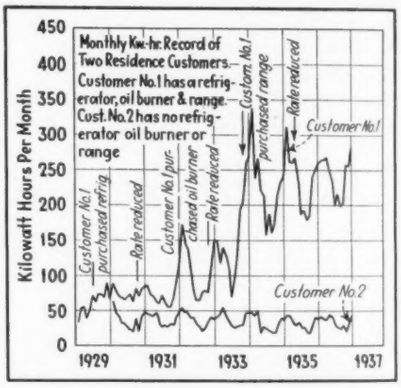


Fig. 1—Progressive customer uses more energy as his service expands

ter to about double the previous figure, repeating in the following winter. Late in 1933 an electric range went into service, and this, combined with the use of more Christmas lighting, put customer 1's consumption on a plane of 300 and more kw.-hr. per month in winter, holding well above the maximum peak usage of earlier years even in summer. Customer 2's usage continued through the years to be low in volume, fluctuating roughly between a minimum of 20 kw.-hr. and a maximum of 55 kw.-hr. per month, and representing a routine apparently but little stimulated by the rate reductions of 1930, 1932 and 1935.

Fig. 2 shows the comparative monthly bills of the two customers, with twelve-month running averages. The rise of customer 1 from an average of around $3 to about $9 per

LOADED CIRCUITS *don't worry* FUSTAT *users*

Stops needless blowing

You can load an ordinary circuit right up to capacity and yet protect it with a 15 ampere Fustat. Its long time-lag keeps it from blowing needlessly as when motors start on washing machines, refrigerators, oil burners and the like.

By eliminating needless blowing, the Fustat *wipes out the only possible excuse for tampering or using over-size fuses.* Yet the Fustat . . .

Stops overloading of circuits

The Fustat cannot be replaced with a penny or other substitute for the fuse — or with a size too large to protect. In fact, side-tracking protection in any way is practically impossible without destroying Fustat or Adapter and thereby clearly showing the user that his protection is gone.

Fits present fuseholders

Thru the use of an inexpensive adapter that locks in place, the Fustat fits in any standard Edison base fuseholder.

On new jobs, you can specify that panels, switches, etc., be equipped with Fustat bases.

Retails at 7½c

If additional circuit capacity is needed, users cannot readily side-step the issue — at the sacrifice of safety.

Destruction of circuit wiring is prevented — fire hazards are reduced — costly shutdowns and expensive repairs are avoided.

Prevents hazardous burnouts of flexible cords — in spite of long time-lag

The Fustat contains a fuse. The ability of a fuse to protect against dangerous cord shorts, grounded sockets, etc., is well known.

The quick action of the Fustat on such dangerous "household shorts" prevents spraying of molten metal, starting of fires, burning of users.

Answers today's demand for trouble-free circuit protection

What other device than the Fustat can permit circuits to be loaded to full capacity — yet prevent dangerous overloading . . . make safe protection remain safe . . . protect against dangerous cord shorts . . . and eliminate needless blows and service interruptions?

Using Fustats for circuit protection — is just good business

The FUSTAT

Retails at 7½¢ in 15 to 30 amp. sizes

For full information write to any of these firms —

BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.
JEFFERSON ELECTRIC CO., Bellwood, Ill.
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.
UNION INSULATING CO., 277 Broadway, New York City

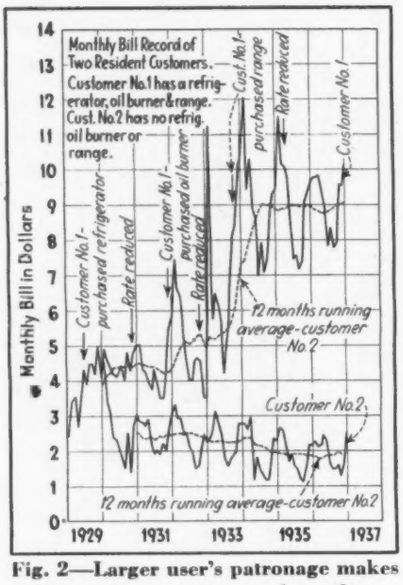


Fig. 2—Larger user's patronage makes him more attractive to the utility

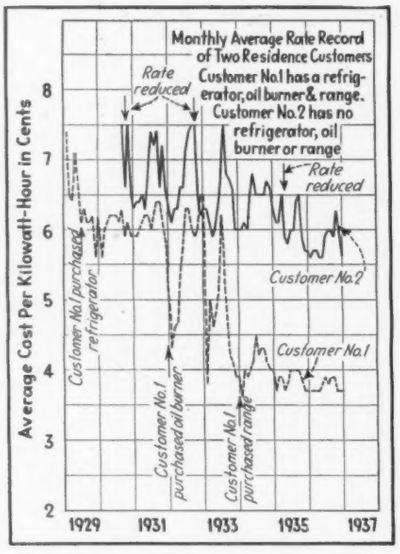


Fig. 3—Larger user's kilowatt-hour prices drop nearly 50 per cent

as major appliances are installed and rates are reduced (typical 1-cent or 5-mill stops), while the small user "pounds along" at a relatively high price, even then being of doubtful value as a customer.

month followed the addition of the three major appliances, the acceleration being most marked with the range, intermediate with the oil burner and relatively striking with the refrigerator. For approximately $6 more per month customer 1 enjoys these three important services which play no part whatever in customer 2's home, and the striking reductions in unit costs to customer 1 appear in Fig. 3. Customer 2, with very limited use and equipment, enjoyed (?) an average rate reduction from around 7.5 cents per kw.-hr. to about 5.5 cents at the end of the period, but apart from the saving of from 50 cents to say $1 a month, he had little if any benefit from the progress of electricity except in lamp equipment efficiency.

Customer 1, using all major appliances except a water heater, saw his average rate per kw.-hr. fall from the order of 7 cents down to 3.75 cents in the period. For close to 3.5 years his rate did not exceed 4.5 cents average, and had stabilized at the end of the period a little below 4 cents.

It seems apparent that the promotion of appliance sales was a far more important factor than rate reductions in the development of usage by the more progressive of these customers, and that the rate cuts were of almost no influence upon customer 2, who was either unable to purchase larger appliances or else indifferent to their value in his domestic economy. The charts offer ample evidence of the value of sales activity and relative inconsequence of rate reductions per kilowatt-hour which can be expressed in postage stamp price terms.

•

Consumer Loses From Inadequate Wiring

By ROY A. PALMER
Illuminating Engineer,
Duke Power Company, Charlotte, N. C.

In a number of instances the salesman from a utility company meets with disinterest on the part of the customer when the question of inadequate wiring is first brought up for discussion.

One effective way to interest the customer in the significance of inadequate wiring is by translating the losses incurred into terms the customer readily understands. The accompanying table illustrates the way in which this method can be used to tell the customer how much he loses by spending money for kilowatt-hours which are used up in losses instead of for producing light.

Losses in Voltage, Light and Dollars in Circuits Wired According to National Code

Length of Run, Ft.	Watts* Load	Wire Size, No.	% Volts Lost	% Light Lost	Annual Loss for Kw. Not Producing Light†
30	1725	14	2.4	7	$3.90
40	1725	14	3.1	9	4.95
50	1725	14	4.0	12	6.50
60	1725	14	4.8	14	7.65
70	1725	14	5.5	16	8.75
80	1725	14	6.2	18	9.70
100	1725	14	8.0	23	12.40
120	1725	14	9.6	27	14.25

* The code allows 15-amp. load on branch circuits: 15 amp. × 115 volts = 1,725 watts.
† Loss per circuit. Total loss for building is this amount multiplied by number of circuits in the building, based on current at 2 cents per kilowatt-hour, 3,000 hours burning per year.

•

One Free One Sells Six Lamps

By F. A. COFFIN
Sales Manager Milwaukee Electric Railway & Light Company, Milwaukee, Wis.

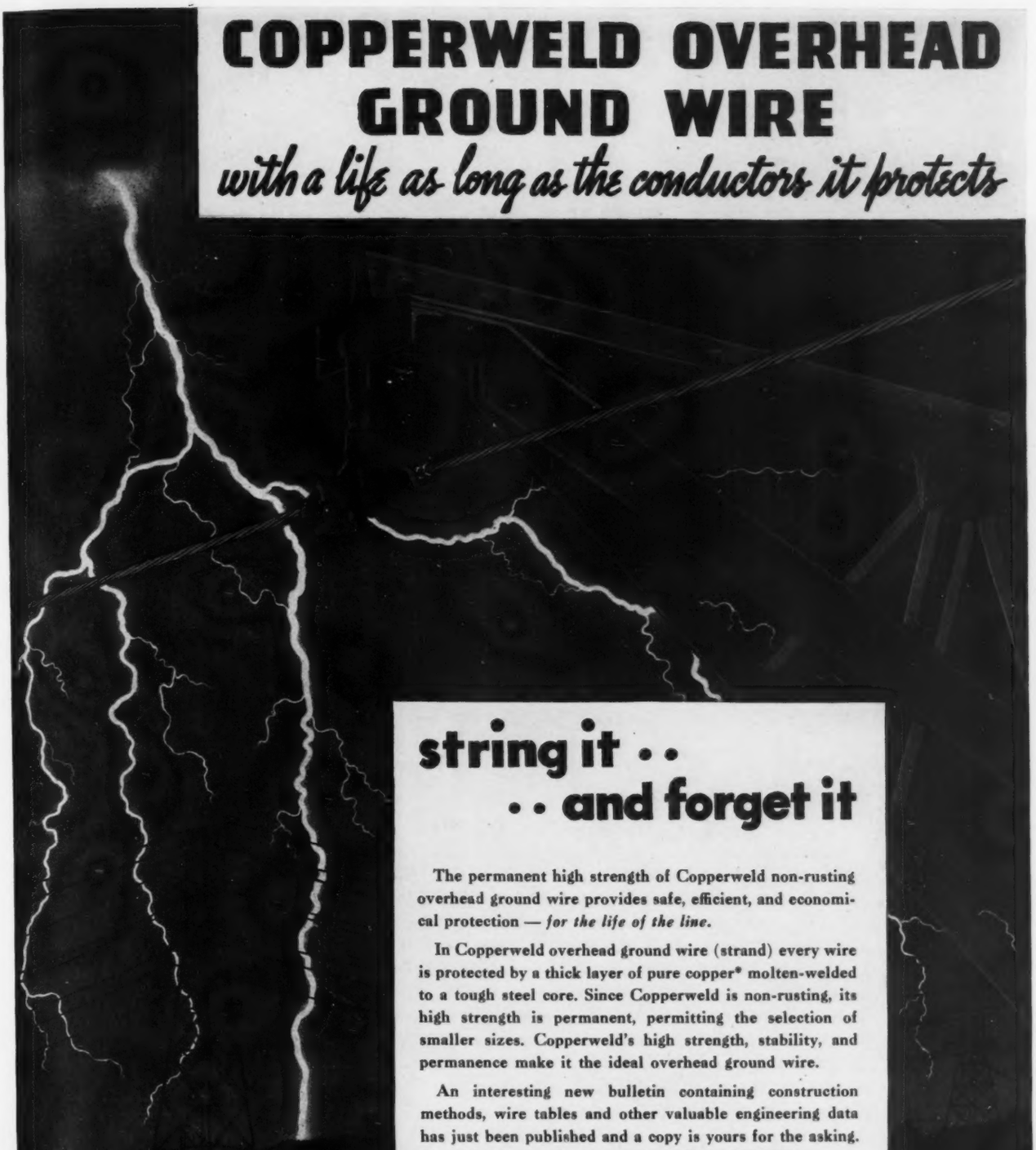
Between 260,000 and 270,000 Mazda lamp bulbs were bought by residential and rural customers of the Milwaukee Electric Railway & Light Company in a one month "Bag of Lamps" campaign last fall. For some years the company had staged spring and fall lamp sales, offering a specially packaged bag of lamps containing two 40, two 60, one 75 and one 100-watt bulbs and sold at regular list prices, $1 per bag. Advertising and other promotional material were designed for the purpose of inspiring the customer to replace old and burned out lamps and to have spares on hand when needed. Dealers were, of course, included in these sales activities and employees of the company were also enlisted. However, the results achieved by these campaigns, while sufficient to justify their continuance, were not at all spectacular.

Then it was decided to try something a little different in the fall of 1937. Previous to the opening of the campaign each residential and rural customer received a coupon with his name on it. Presentation of this coupon to any Mazda dealer or to any company store between October 15 and November 15 entitled the customer to one 100-watt lamp free with the purchase of one or more bags of lamps. The company, working through the distributor or jobber, redeemed the coupons from the dealers by replacing the lamps given to the customers.

Company employees were paid an attractive commission on lamps they sold. Also, a series of prizes were offered, a Telechron clock, a Schick electric razor and a complete Toastmaster Hospitality Tray with stand for sales respectively of 100, 250 and 500 bags of lamps.

COPPERWELD OVERHEAD GROUND WIRE

with a life as long as the conductors it protects



string it . . . . and forget it

The permanent high strength of Copperweld non-rusting overhead ground wire provides safe, efficient, and economical protection — *for the life of the line.*

In Copperweld overhead ground wire (strand) every wire is protected by a thick layer of pure copper* molten-welded to a tough steel core. Since Copperweld is non-rusting, its high strength is permanent, permitting the selection of smaller sizes. Copperweld's high strength, stability, and permanence make it the ideal overhead ground wire.

An interesting new bulletin containing construction methods, wire tables and other valuable engineering data has just been published and a copy is yours for the asking. In writing for it, please mention Bulletin ED 1678.

**Every wire is tested and the thickness of copper is guaranteed.*
(See Copperweld Steel Company's Specification BW-35.)

COPPERWELD STEEL COMPANY

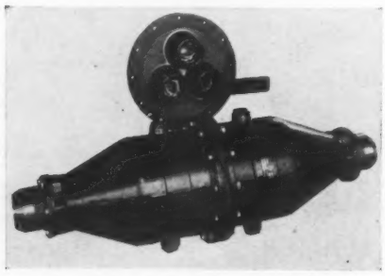
Glassport, Pa.

COPPER · BRONZE · COPPERWELD RODS, WIRE, AND STRAND

New EQUIPMENT AVAILABLE

Cable Stop Joints

A new line of stop joints, to prevent oil and compound migration through the different lengths of a cable installation, is being brought out by this company. Stop joints isolate each length of cable; these



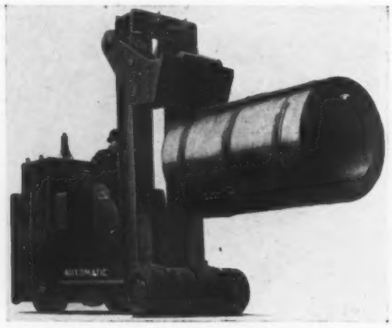
Type "SJ" joints; for various sizes of cables and voltages; pictured type for 3/C, 15-kv., 750,000-circ.mil. cable, flnage with bushings and connectors and wrench above joint. **G & W Electric Specialty Co.**, Chicago, Ill.

consist essentially of two cableheads with wiping sleeves, bolted together about a brass flange. Flange has straight-bore porcelain insulators which are long enough to overlap conductor insulation, so that no taping is required. Copper connector sleeves with solid wall in middle are soldered to conductor ends. Oil-proof "squeeze" bushings seal copper connectors within the porcelain bushings. "Resistoyl" gaskets are used on all joints.

•

Electric Tractor

Developed primarily for use in steel strip mills, new center-control, ram-and-fork tractors will handle the wider welded-type coils 84 to 96 in. long, weighing up to 30,000 lb. Outstanding feature of the new tractor is its "Steer-o-matic drive," a combination drive unit and motorized



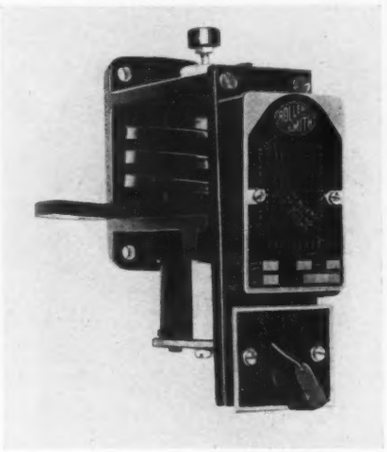
Center-control, ram-and-fork type tractor; gas-electric unit or battery power supply; capacity, 15 ton wheelbase, 90 in. **Automatic Transportation Co.**, Chicago, Ill.

steering turntable, controlled automatically—separately by remote power steer and fully remote contactor control with automatic drive acceleration from operator's station. Another feature is the arrangement of the load wheels, four abreast.

•

Thermal Magnetic Trip

Recommended particularly for a.c. motor circuits to prevent tripping on starting currents, this thermal magnetic trip attachment for air circuit breakers will permit high currents to flow for a safe period, but will trip the breaker before a dangerous temperature is reached. If current is high enough to indicate a defect in the circuit, tripping occurs in-



Thermal-magnetic trip attachment; for Types BD and HD air circuit breakers, ranges 0 to 6,000 amp., a.c. only. **Roller-Smith Co.**, New York, N. Y.

stantaneously. Device consists essentially of an electromagnet with the usual series coil and, in addition, a short-circuited winding on the same core, feeding a thermal relay, and a holding coil for the tripping core. It mounts directly below breaker frame and has a plunger that strikes the tripping latch.

•

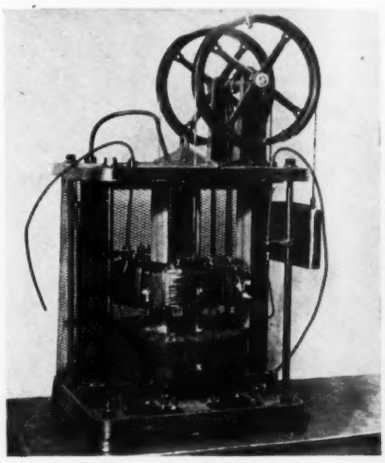
Cable Connector

"Lock-Tite" lug; sizes to fit cables from No. 4 through 1,000,000 circ.mil. **Thomas & Betts Co.**, Elizabeth, N. J.

New cable lug is offered to fit all kinds of cable—solid, stranded, flexible or hemp-core. Surface of cable is clamped by a curved and rounded cable shield in the oval-shaped body recess; cable-bearing surfaces are grooved for equalized pressure contact. Locking disk built into the cable shield provides for tightness; key wrench tightens screw holding the shield.

Current Regulators

Two new station-type constant-current regulators have been announced: One, a non-automatic model, is designed to oper-



Type RZ fully-automatic constant-current regulator shown; non-automatic known as Type RS. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

ate in an indoor substation with a manually operated control panel. The other is an automatic type, designed primarily for use in an unattended substation. Latter type may be controlled by either a RCOC switch or a time switch, the same as a pole-type regulator. Both types are air-cooled with shell-type cores. The non-automatic type will regulate from full load to no load within one per cent, plus or minus, of rated secondary current when operated at primary voltage and frequency and on unity power factor load.

•

Glass-Covered Magnet Wire

"Vitrotex" magnet wire, leads and coils. **Anaconda Wire & Cable Co.**, New York, N. Y.

Flexible fiber glass insulation is now being used by this company for its "Vitrotex" magnet wire, leads and coils. An outstanding characteristic of the material is its ability to withstand high temperatures for long periods of time; test coils have been heated to 1,100 deg. F. for limited periods without causing shorted turns, according to the manufacturer. Dielectric strength and insulation resistance are high and not seriously affected by high temperature nor high relative humidity. Space occupied by the magnet wires is less than double cotton of the same gage. Insulation is said to be mechanically strong.

It's Something to be Worried About!

IN these days of mounting costs, higher taxation and keener competition within and without the industry, utilities cannot afford to continue indifferent to losses from current diversion. Such needless losses . . . frequently looked upon as a necessary evil, and accepted as a matter of course . . . can be completely eliminated by the use of Corcoran-Brown New Sequence Service Equipment at a cost that is but a fraction of the losses themselves.

Many utilities, through scores of thousands of installations, are enjoying the profitable advantages of CB equipment, not only in the prevention of current diversion, but through savings in time, labor and money in installation. Consult CB engineers, without obligation—they will be glad to cooperate with you in solving your problem of current diversion. Details and literature will be sent on request.

Electrical Department

CORCORAN-BROWN LAMP DIVISION

THE ELECTRIC AUTO-LITE COMPANY

4900 Spring Grove Avenue Cincinnati, Ohio

Solve your Lamp guard problems with

SAFEGUARD

- SCREWLESS
- SHOCKPROOF
- PORTABLE
- MADE OF FIBRE
- ECONOMICAL
- 100% INSULATED
- APPROVED by UNDERWRITERS

Send for literature

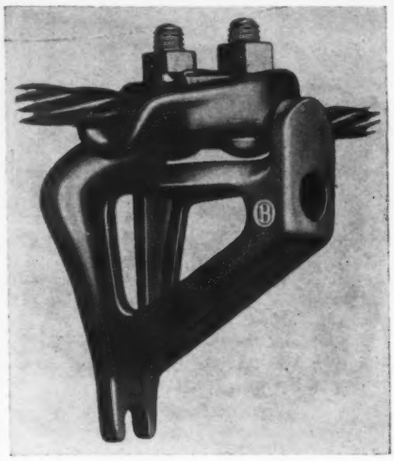
We have several sales territories open and invite correspondence from sales representatives.

HERE'S HOW IT WORKS

SAFEGUARD
ELECTRIC COMPANY INC.
1 DeKalb Ave. Brooklyn, N. Y.

Ground Wire Bracket

Using a clamp mounted on top of the device, a bracket for supporting overhead ground wires on wood pole lines is said to save 6 inches or more of pole height over previous designs. Since clamp pivots



Rocking ground wire bracket; clamp holds any wire from ¼ to 9/16 in. **Ohio Brass Co.**, Mansfield, Ohio.

15 deg. above or below neutral position, ample clearance for rocking action is provided, tending to prevent damage to ground wire at point of attachment. Stringing ground wire is said to be facilitated with this type of device in that wire can be transferred directly from stringing blocks to clamp. Wire is then secured by placing keeper piece over wire and tightening bolts. Clamp seat accommodates total horizontal angles of 30 deg.

•

Canopy Lighting Unit

Model "WC" Canopy Localite. **Fostoria Pressed Steel Corp.**, Fostoria, Ohio.

Prompted by the acceptance of its canopy "Localite," which uses silvered-bowl lamps or clear lamps with Alzak cups, this company has added a new unit of similar character. New model is 36 in. wide and is available in 2½-ft. multiple lengths with a minimum of 5 ft. Either 150- or 200-watt lamps may be used; one socket to each 2½-ft. length. According to the manufacturer, it delivers an average of 33-foot-candles with two 150-watt lamps over an area of 4x6 ft. at a mounting height of 48 in. above the working surface.

•

Vacuum-Tube Timer

A new general-purpose vacuum-tube timer has been announced for application to industrial machinery, particularly machine tools, which require a definite time delay during operation. Equipment uses a G.E.-6C5 three-element, high-vacuum metal tube which can be easily and inexpensively replaced through any radio supply store when necessary. Timer is calibrated with a scale having ten divisions proportional to time; maximum and minimum operating times on 115 volts are about 60 seconds and three seconds.

Vacuum-tube time-delay relay; for operation on 115 or 230 volts, 50 or 60 cycles; contact tips rated at 1 amp. at 115 volts, 0.5 amp. at 230. **General Electric Co.**, Industrial Dept., Schenectady, N. Y.

•

Arc-Welding Electrodes

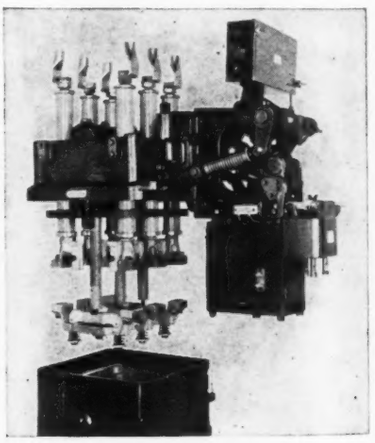
"McK" shielded-arc-welding electrodes; line includes all-position welding type, flat-position and fillet welding type, and styles for a.c. transformer welding machines. **McKay Co.**, Pittsburgh, Pa.

New line of shielded-arc-welding electrodes is said to be quieter in operation, faster in welding time, to produce finer bead appearance and have greater adaptability per rod. According to the manufacturers, while the new electrodes are an improved type, no changes in customary operating practice are required.

•

Indoor Oil Circuit Breaker

Designed for heavy-duty starting of large synchronous and induction motors, this indoor oil circuit breaker is recommended especially for steel mill service, including rolling mill starting and jog-



Type DX-40; 600 and 1,200 amp., at 15 kv.; rupturing capacity, 100,000 kva. **Allis-Chalmers Mfg. Co.**, Condit Works, Boston, Mass.

ging. A special feature is the use of "expulsion ports," which hasten arc extinction. Main contacts are of the wedge-and-finger type, with silver contact surfaces; arcing contacts are the large, butt type. It is furnished for mechanically trip-free manual or electrical operation.

•

Fuse Reducers

Fuse reducers; for 250 and 600 volts; types range from 60/30 amp. to 600/400 amp. **Kolton Electric Mfg. Co.**, Newark, N. J.

Suggested uses for newly announced fuse reducers include: On system changes from 600 to 250 volts, special adapters can be made so that the same switches, panelboards and cutout can remain in place. New circuits can intentionally be designed for larger switches and fuse gaps, fuse reducers used for the present loads and then removed when the load has been increased. Again, on two-phase, three-wire circuits, a 400-amp. switch may be used, with the

center leg fused at 250 amp. Outside legs should be fused 175 amp. each, but can not because fuse gaps are 400 amp. Fuse reducers permit proper fusing.

•

Radio Noise Control

New radio interference eliminator should be particularly interesting to utilities with radio noise control problems. Essentially

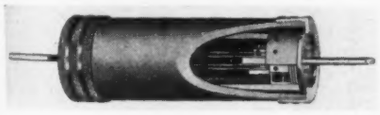
"Power filter;" up to 60 amp. capacities; in semi-tuned and untuned models. **Whisk Laboratories,** 145 West 45th St., New York, N. Y.

a power filter device, the unit is designed to remove extraneous noises caused in a radio circuit by sparking devices or other outside interference and is to be installed at source of interference.

•

Renewable Fuses

Screened vents are used at both ends of the fuse case in this new renewable fuse to provide ventilation under load conditions and to allow gases to escape after the fuse has blown without danger of



Pierce renewable fuses; from 15 to 600 amp. capacity, 250 and 600 volts. **Pierce Renewable Fuses, Inc.,** Buffalo, N. Y.

fire. Another feature of the fuse is simplicity of design; it has only two parts—inner and outer cases—and the link. In a series of tests made on these fuses under actual load conditions it was found that they operated from 5 to 40 per cent cooler, according to the makers.

•

Industrial Luminaire

Catalog No. U-818; uses 200-watt lamp. **Holophane Co., Inc.,** New York, N. Y.

Prismatic light control element of this new luminaire for the illumination of loading platforms, underpasses, pedestrian tunnels, etc., combines in a new construction the principles of light concentration from lens construction and widespread characteristics of a refractor. This combination, called "Refractolens," directs upward light from a 200-watt lamp down toward surface to be lighted in a fan-shaped pattern. A small spherical reflector is used in back of the lamp. The light is said to be so distributed that the illumination is substantially uniform at maximum spacings of four times the mounting height.

Range Switch

"Fusedbreak;" line consists of flush and surface mounting device with facilities for range fuses and four plug fuses. **Square D Co.,** Detroit, Mich.

A range switch with unfused main, now permitted by the National Electrical Code, is a new development; it has an externally operated main switch for replacement of branch fuses. Main switch can be sealed in the "off" position and provisions are made for sealing door covering branch fuses as well as entire cover. Side wiring gutters permit bringing in both line and load at either top or bottom. Switch is dead front and self-ventilating.

•

Controller By-Pass

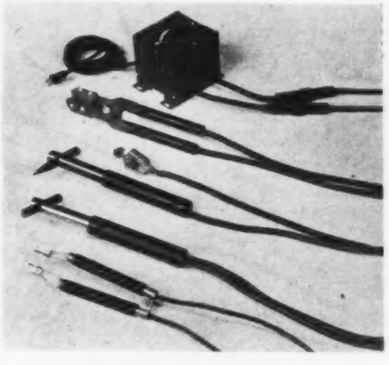
Manual by-pass, standard equipment on Taylor "Fulscope Micromax" controllers. **Taylor Instrument Co.,** Rochester, N. Y.

In some controller applications it is desirable to start the apparatus on hand control and then to cut in the automatic control as the operating temperature is reached. For such applications a manual by-pass has been added to this company's previously announced "Fulscope Micromax" controller (ELECTRICAL WORLD, September 25, 1937). When hand operation is desired this equipment enables the operator to change the controlling-medium input at the instrument where its effects are recorded. Two adjusting knobs are provided on the instrument sub-panel; one provides for the change from automatic to manual control, the other permits regulation of the air supply pressure when the switch is made.

•

Electric Soldering Unit

Offered for all types of soft soldering work, this new soldering unit consists of a transformer and four heads or tools and is plugged into any a.c. supply. "Midget" type head is designed for soldering small terminals and lugs up to 150 amp. or sweating threadless copper tubing and fittings up to ⅜ in. diameter. "Standard" type head is suggested for applying and



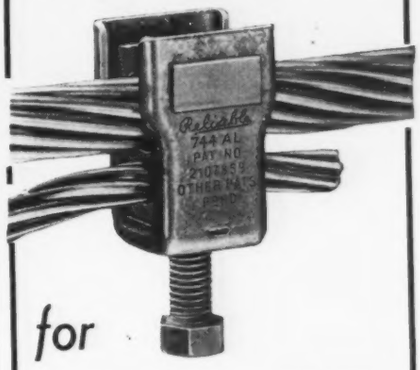
"Deluxe" Thermo-Grip soldering unit, showing ground clamp and four types of heads. **Ideal Commutator Dresser Co.,** Sycamore, Ill.

removing soldering lugs and terminals up to 400-amp. size, up to 1-in. copper pipes and fittings and for making stator connections. "Fork" type head is convenient for heating small lugs, terminals and connections difficult to reach with other tools. Finally, a "pencil" type head is adaptable for soldering seamed joints, spot soldering and for getting into tight places. Foot-operated switch is offered for those jobs where speed is particularly necessary.

NEW

Reliable

TAP CLAMPS



for

tap connections to aluminum over armor rods

Aluminum to Aluminum
Aluminum to Guy Wire
Aluminum to Copper

★ Convenient to install

★ Copper and aluminum are well separated

★ Aluminum parts of clamp contact armor rods

★ Copper surfaces contact the copper tap wire

Write for details

Reliable ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES

Look at *Every* angle of your conduit job !

★ more for your money from *Every* angle in L-M FIBRE CONDUIT

YOU'RE money ahead with L-M Fibre Conduit right from the time the first truckload arrives on the job. You save on installation cost because it's a *light* conduit, easy to carry from truck to trench, easy to handle in the trench. L-M Fibre Conduit *lays faster* because it is uniform in every detail . . . length, bore, wall thickness and machining of joints. *Strong-walled,* it keeps your breakage delays to a minimum.

Yet low-cost installation is just the start of L-M Fibre Conduit economy. Your cable is always protected from destructive abrasions by the *smooth inside surfaces* of L-M Conduit. The precision machined L-M Conduit joints are water-tight. And L-M Fibre Conduit is *neutral to soil acids and alkalis,* giving it unsurpassed resistance to chemical decay in any soil or any climate. The result is extra years of protection for your conduit dollar.

GET FULL PARTICULARS FROM YOUR L-M REPRESENTATIVE

LINE MATERIAL CO.

News ABOUT PEOPLE

Simplex Promotes Davis; Roberts New Sales Manager

William S. Davis has been promoted to a vice-presidency, George L. Roberts to the sales managership and George A. Grauer to the position of assistant sales manager of the Simplex Wire & Cable Company, Cambridge, Mass. Mr. Davis joined the company in 1896 as an order clerk, and after extended field and office experience was made sales manager in 1919. He was a co-developer of the company's "Fibrex Tree Wire," which enlarged its line of central station products materially at the time of its initiation.

Mr. Roberts entered the organization in 1915 as a wire dispatcher, later being transferred to the electrical engineering and testing departments. After war service in the Navy, U. S. Radio School and Radio Intelligence Division, he returned to the Simplex plant and soon became a sales clerk. Field experience followed, and in a

W. S. Davis

short time he was transferred to the coal mining area as a "Tirex" specialist. He became assistant sales manager in 1927, and is a director of Wentworth Institute.

Mr. Grauer became attached to the Simplex staff in 1935 after extended experience with the Goodyear Tire & Rubber Company and United States

G. L. Roberts

Rubber Company in sales work. For a time he was sales manager of the mechanical rubber goods and wire departments of the latter. Early in 1934 he was made executive secretary of the wire and cable section under the NRA Code, going to the Simplex company when the NRA act was voided.

•

▶ J. M. Fore of Ft. Mitchell, Va., has been appointed to the agricultural engineering staff of Purdue University to conduct research work in rural electrification. Mr. Fore, who was graduated from Virginia Polytechnic Institute in 1935, received his master's degree in agriculture from Purdue last June. Since that time he has been employed by the Northern Indiana Power Company.

▶ George W. Wardwell, Jr., has been appointed designing engineer for the General Electric Company's home laundry equipment section, Bridgeport, Conn. Mr. Wardwell, who joined the G. E. fan engineering staff in 1929, also served as engineer in the sunlamp and wiring device sections before being transferred in 1931 to home laundry equipment. In his new position he will be responsible for the design of washers and of flatplate and rotary ironers.

Westinghouse Lamp Gives Frankel New Assignment

Appointment of Adolph Frankel as merchandising manager has been announced by A. E. Snyder, executive sales manager of the Lamp Division, Westinghouse Electric & Manufacturing Company. Mr. Frankel is opening temporary headquarters in Boston, Mass., where he will establish the first regional field office for handling the distribution and marketing of the new Westinghouse Sterilamp, the result of many years experimentation by Drs. Harvey C. Rentschler and Robert F. James of the Westinghouse research laboratories.

Mr. Frankel entered the employ of the Westinghouse company in December, 1917, where he worked at the packing counter of the advertising department in Bloomfield, N. J. His diligence soon earned him promotions in the advertising department. Later he was transferred to the executive

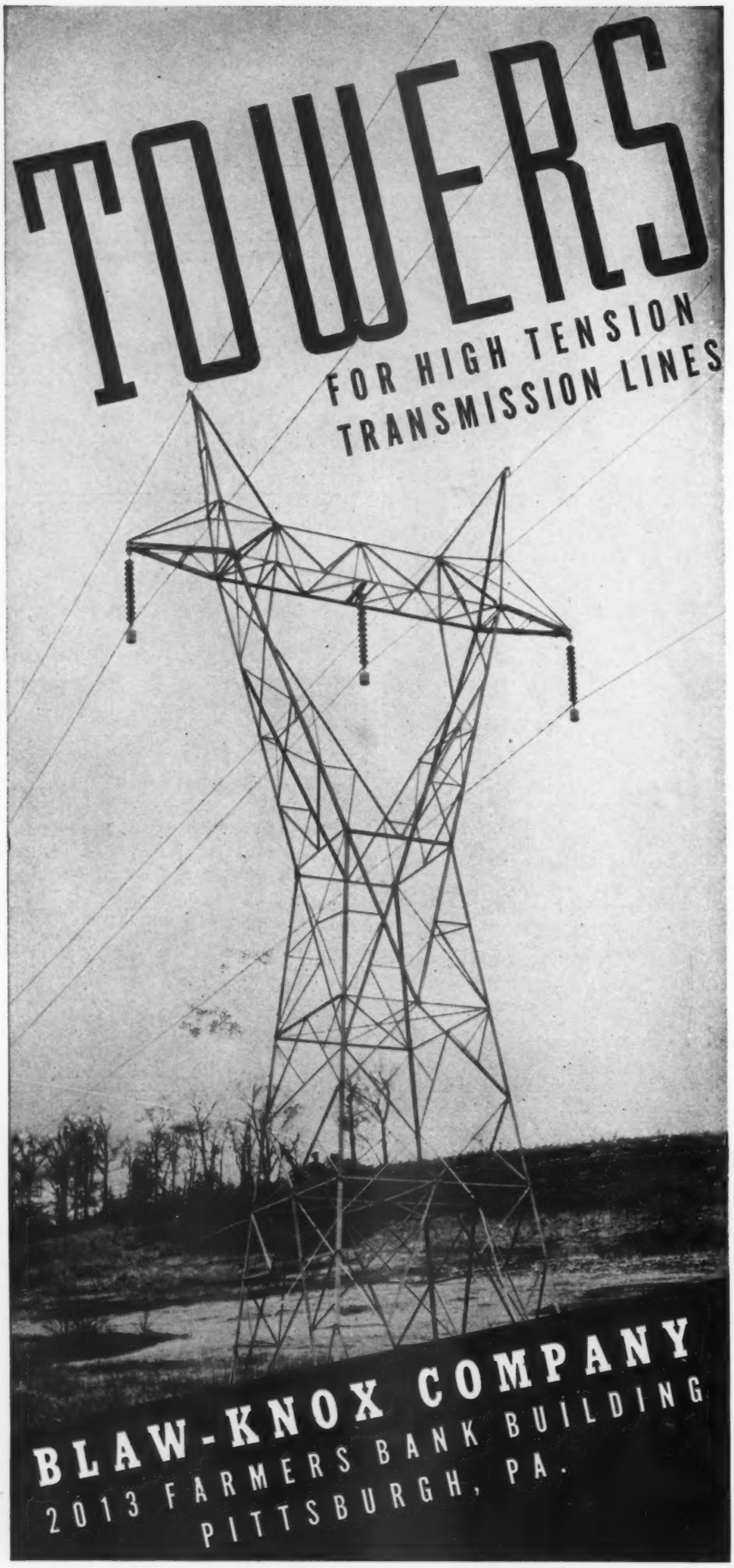
Blank & Stoller

A. Frankel

sales department of the company in New York, where, for the past five years, he has been handling merchandising and marketing for the Westinghouse Lamp Division.

•

▶ John H. Ward, factory manager of the Palmer Electric & Manufacturing Company, Wakefield, Mass., and as-



sociated with that organization for the past fifteen years, has been appointed sales manager for the territory east of the Mississippi River with headquarters at Wakefield. Ben P. McKinley, formerly general sales manager, has been made sales manager of the trans-Mississippi territory, with headquarters in Chicago.

▶ J. Robinson, electrical engineer, has been appointed to the Board of Fire Underwriters of the Pacific in Los Angeles, to succeed J. DeVoe, who resigned recently.

▶ William F. Graham, for the past twelve years connected with the Alabama Public Service Commission's engineering department in Birmingham, has resigned to join the Federal Power Commission's regional staff in Chicago.

▶ John S. Garceau, formerly advertising manager of the home appliance division of Fairbanks, Morse & Company, has resigned to join the Crosley Radio Corporation, Cincinnati, as advertising manager, succeeding Glenn H. Corbett, resigned.

▶ William B. Petzold, for many years engaged in styling and industrial designing, has returned to the plastics department of the General Electric Company with headquarters in Pittsfield, Mass. Mr. Petzold, who previously spent four years with G. E., will be responsible for the functions of the styling section. Mr. Petzold is a native of Chicago, where he attended the American Academy of Art and Van Ambergh's private school of art. Upon being graduated, he joined the General Electric office in Chicago, where he remained for three years before transferring to Bridgeport for a year.

▶ A. C. Danekind, chairman of General Electric's factory equipment and practice committee, was elected a director of the Locke Insulator Corporation at a recent meeting of the board of directors. For several years Mr. Danekind, in his capacity as a member of the staff of the G.E. manufacturing general department, has been primarily interested in machine tools and processing. In this connection he is well-known in the machine-tool industry, having served as president and chairman of the Machine Tool Congress.

▶ David S. Gray has been appointed manager of water heater sales and Stanley G. Fisher manager of dishwasher sales, according to an announcement by Reese Mills, manager of the Westinghouse range and water heater department. Both men will center their activities at Westinghouse merchandising division headquarters in Mansfield, Ohio. Mr. Gray has been affiliated with

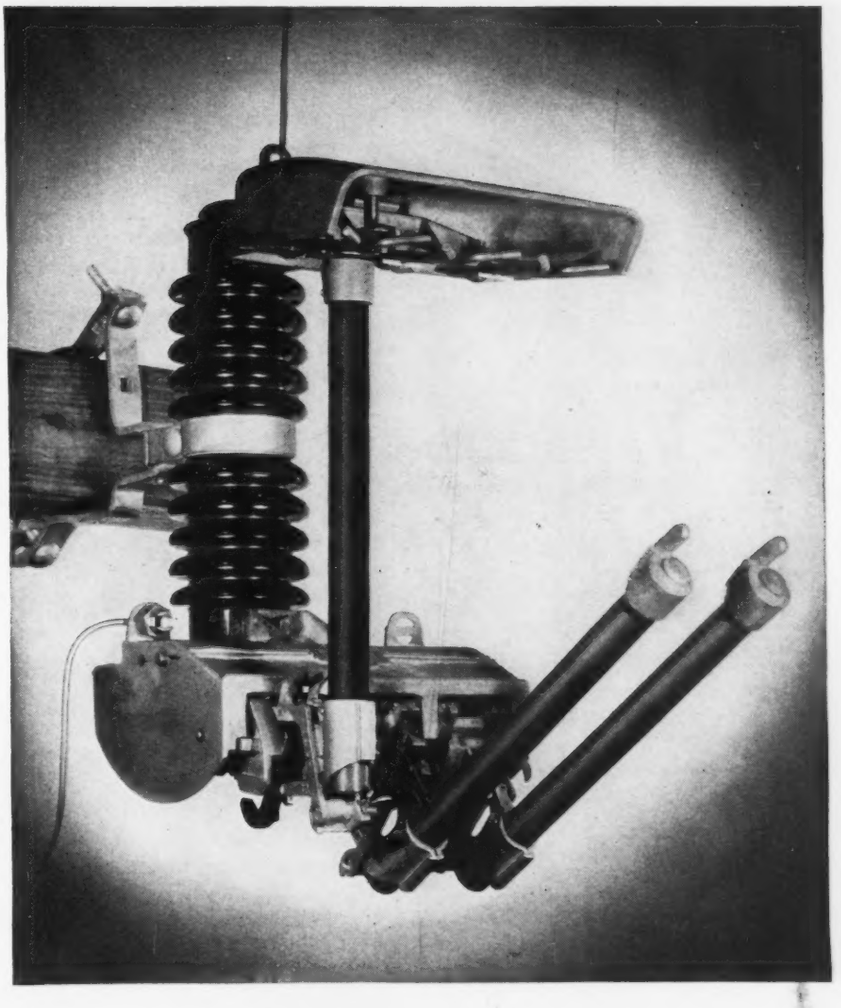
Four-Way Protection

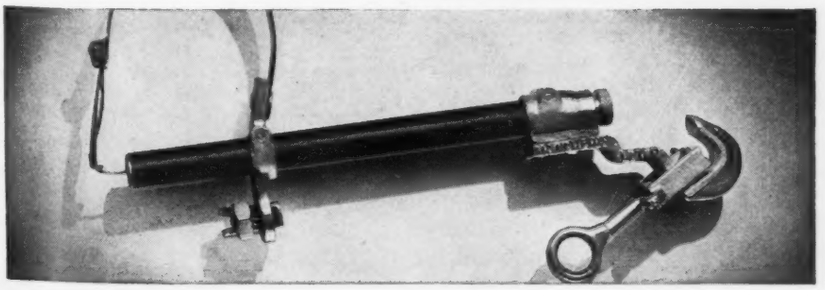
from Bakelite Laminated

YOU GET four-way protection when you install cut-out switches that have fuse-tubes made from Bakelite Laminated. There is the protection against punctures and flash-overs which its high dielectric properties provide. Then, the added safety to operators. Also, your fuse system is safeguarded against breakage from mechanical shocks, and from depreciation due to extreme weather conditions.

These are typical advantages of Bakelite Laminated wherever it is used as insulation in power system equipment. This material is strong, tough and wear-resistant. It withstands heat, cold, sun and rain, without deterioration. It possesses high dielectric strength and resistivity, and is practically "shatterproof" and "weatherproof".

From fuse tubes to bus-bar insulators, and from instrument parts to circuit breaker spindles, dielectric parts are more dependable, electrically and mechanically, when made from Bakelite Laminated. Write for our new booklet 3L, "Bakelite Laminated", which describes many valuable services rendered by this material.





(Above) "Trip Saver" switch with 3 fuse tubes of fiber-lined Bakelite Laminated (Spauldite). Product of James R. Kearney Corp.

(Left) "HoTap" suspension cutout with Bakelite Laminated tube. Product of W. N. Mathews Corp.

BAKELITE CORPORATION, 247 PARK AVENUE, NEW YORK, N.Y.

BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Canada

West Coast: Electrical Specialty Co., Inc., Los Angeles and San Francisco, Cal.

BAKELITE

REGISTERED U. S. PAT. OFF.

The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the symbol "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products.

PLASTICS HEADQUARTERS

ROCK ANCHORING
NO LONGER A PROBLEM OR A HAZARD

THE CHANCE ROCK ANCHOR

The troubles and hazards of rock anchor installation are practically eliminated with the Chance Rock Anchor. It requires no lead or concrete. Just drill the hole, drop the anchor in the hole and expand by turning the rod. It wedges in and holds tight.

A·B·CHANCE CO·
Dept. B, Centralia, Missouri

TIPS GRIP-ALL CLAMP STICK

Tips Grip-all Clamp Stick will handle hot clamps, disconnects, hot wires and does many other hot line jobs. Safety catch and sliding hand grip adjusts and holds the claws in various positions as shown at right.

TIPS TOOL CO.
DIVISION OF A·B CHANCE CO.
TAYLORVILLE ILL. CENTRALIA MO.

the central district of Westinghouse as its range and water heater supervisor. He has had extensive experience in the merchandising field. Mr. Fisher has been in the dishwasher sales department for approximately eight months, having been transferred to the sales department after being connected with the Westinghouse merchandise advertising department for some two years.

▶ PAUL F. SISE, president of the Northern Electric Company, Ltd., Montreal, Canada, was elected a director of the Shawinigan Water & Power Company at a meeting of the board held recently in Montreal. He succeeds the late Col. G. P. Murphy of Ottawa. Mr. Sise became secretary-treasurer of the Northern Electric & Manufacturing Company, Ltd., in 1904, and in 1910 was appointed managing director of that company. When the company was amalgamated with the Imperial Wire & Cable Company in 1914 he was made vice-president and general manager of the new organization. He was appointed to his present position in 1919, succeeding his brother, E. F. Sise. Early in his career Mr. Sise was connected with the Westinghouse interests in the United States and then in Canada.

OBITUARY

▶ THOMAS R. TETLEY, engineer connected with the Federal Power Commission in the Chicago district, died March 21 in St. Louis, at the age of 58.

▶ HORACE J. SNEDEN, 58, superintendent of plants for the Indianapolis Power & Light Company, died recently, after an illness of almost a year. He had been with the company for many years and was promoted to general plant superintendent in 1927. Mr. Sneden was a native of Salem, Mass.

▶ WILLIAM A. HASKELL, formerly superintendent of construction at the Lynn Works of the General Electric Company, and at one time superintendent of the Marblehead (Mass.) municipal light department, died at his home in Marblehead March 21, at the age of 68.

▶ D. W. CLOTHIER, fromerly managing director of A. Reyrolle & Company, Ltd., switchgear manufacturers at Hebburn-on-Tyne, England, died in Auckland, New Zealand, March 11, in the course of a private and business tour. He was 65 years old. Mr. Clothier relinquished some executive activities in April, 1937, but continued in an advisory capacity. A pioneer on metal-clad switchgear, he joined the staff of Messrs. A. Reyrolle & Company in 1906.

Utility Wins Rate Dispute

Philadelphia Electric Company's recent refusal to transmit power at a wholesale rate to a "Villa d'Este" group of 132 duplex dwellings in Upper Darby, Pa., has been sustained by the State Public Utility Commission. Charges had been brought against the utility by the Real Estate-Land Title & Trust Company.

•

Consider New Power Plant

City officials of Ogdensburg, N. Y., and officers of the Algonquin Paper Company are considering an investigation into the cost of constructing a power plant which could supply electricity for the city and paper mill at a rate presumably much lower than the present charge.

•

Extends Natchez Franchise

City of Natchez has agreed to a twelve-year extension on franchise of the Mississippi Power & Light Company whereby company agrees to carry through recent plan for construction of high tension power lines from Sterlington, La., to meet the city's additional requirements as the Armstrong Rubber Company, a Sears-Roebuck unit, starts erection of a $1,000,000 plant in Natchez. Contract with the Armstrong company requires utility company to furnish a minimum of 2,000 hp., an amount that exceeds by 30 per cent the entire output of the present Natchez plant of the utility.

•

United-Carr Appoints Tarr to Direct Production

With the announcement of new and improved laminated phenolic insulation from the laboratories of United-Carr Fastener Corporation comes word that the production and marketing will be under the direction of Lester W. Tarr. Recently appointed to the executive staff of United-Carr, Mr. Tarr was formerly associated with E. I. DuPont de Nemours & Company, Inc., and Continental Diamond Fibre Company.

•

New G.E. Capacitor Booklet

General Electric Company has published the booklet "Pyranol Capacitors for Central Station Application." Essentially a pictorial presentation, the booklet also describes steps in the production of these capacitors, from selection and processing of raw materials to testing of completed product, and briefly list sizes and types available.

"In 12 years, we have never had a battery failure with EXIDE-IRONCLADS"

"IN 1924 we purchased two electric industrial trucks equipped with four 12 MVM-19 Exide-Ironclad Batteries to be used in twenty-four hour service. These batteries were renewed in 1929 with new Exide-Ironclads of the same size after they had given an average life of sixty-one months. Last year, we again renewed three of these Exide-Ironclads that had given an average life of seventy months.

"During this long term of service, we did not have a single battery failure nor any repair expense on the batteries."

These are the comments made by a prominent user of electric industrial trucks. Such experiences are by no means unique, for the Exide-Ironclad Battery consistently delivers this type of long and faithful service, requiring at all times only a minimum of maintenance.

In material handling and cargo handling, where the service must be continuous, speedy and utterly dependable, you will find that Exide-Ironclads can improve your service and cut costs. Write for free booklet, "In Selecting Any Motive Power Battery Be Sure."

Truck illustrated made by Baker-Raulang Company

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Manufacturing AND MARKETS

Manufacturers' Sales Gain Over January

Manufacturers' sales of electrical machinery, apparatus and supplies during February, 1938, as reported by 21 firms, totaled $7,225,000, an increase of 2.8 per cent over January, 1938, but a decrease of 6.2 per cent from February last year, according to the Department of Commerce.

The increase over the preceding month follows a decrease of 11.4 per cent reported January over December, 1937. The decrease from a year ago is equal to that reported in January from 1936.

Total manufacturers' sales as reported to the department by 820 firms were $163,166,000 for February, 1938, an increase of 1.4 per cent over January and a decrease of 22.4 per cent from a year ago.

•

Electrical Exports Show Decrease Over Year Ago

Exports of electrical machinery and apparatus during the first two months of 1938 amounted to $15,482,000 compared with $15,474,000 for the corresponding period last year, according to the Department of Commerce. For February these exports were $7,695,000, against $8,003,000 for February last year.

In the first two months of this year exports of household refrigerators were 19,279, valued at $1,504,000, against 20,737, valued at $1,500,000, in the corresponding period last year. Exports in February were 10,037, valued at $769,000, against 11,381 valued at $789,000, in February last year.

•

Canadian Westinghouse Reports Business Increase

In reporting net income of $1,331,758, equal to $2.43 a comon share, for 1937, as against $722,311, or $1.32 a share, in the preceding year, Canadian Westinghouse Company, Ltd., stated the recession in the United States began to have a retarding influence upon the upward trend in Canada during the closing months of the year.

Paul J. Myler, president, stated that the total business done in the apparatus field was nearly twice that of 1936. In all domestic appliances and radio there was a normal increase in sales volume. The extensions and improvements to plants have been completed, Mr. Myler said, placing the company in a position to take care of future demands.

•

N. Y. Dealers Open Refrigerator Drive

Manufacturers have joined with New York City electrical dealers in staging an intensive electric refrigeration campaign which promises to swing additional spring sales.

Last week at a meeting the New York distributors of Crosley, Frigidaire, General Electric, Gibson, Hotpoint, Kelvinator, Leonard, Norge, Sparton, Stewart Warner and Westinghouse rallied dealers to join in the drive which will feature the low cost of modern refrigeration and its safety, swift freezing and simplicity.

More than 3,000 dealers, salesmen, distributors and manufacturers attended the meeting sponsored by the Electric Refrigerator Association of New York. A broad advertising campaign in local publications will boost the campaign. The association's trade characters, Electric Cold, a Scotch Eskimo, will dominate the campaign.

•

Gets Turbine Order

Baldwin-Southward Corporation, subsidiary of Baldwin Locomotive Works, has been awarded a contract by the finance board of Greenwood County, South Carolina, for the construction of three hydro-electric turbines for the water-power development at Buzzard Roost near Greenwood. The value of the order is approximately $260,000.

Pay Reduction Made by General Electric

A pay reduction for all salaried employees of the General Electric Company working full time and earning more than $2,000 a year was announced last week by Gerard Swope, president. The reduction, effective April 11, will be made according to a sliding scale, based on the amount above $2,000 paid to each employee.

Mr. Swope explained that the plan does not affect the first $2,000, but is on the amount above that figure. On salaries up to $10,000 a year the cut is 10 per cent, over that amount and up to $25,000 15 per cent, and over $25,000 it is 20 per cent.

It was stated by Mr. Swope that shop employees have been laid off, while most of the others are working less than 40 hours a week. Rates of pay have not been reduced.

Orders received in the first two months this year, Mr. Swope said, showed a decrease of 36 per cent from the same 1937 period. This downward trend continued in March, with an estimated decrease of 50 per cent from March, 1937. The reductions in salaries are being made to cut expenses and meet the change in conditions.

•

Lead Shipments for Cable

Domestic shipments of lead to manufacturers for cable covering during February totaled 3,713 tons, against 4,603 during January and 7,406 during February, 1937, according to the American Bureau of Metal Statistics. Shipments in the first two months this year were 8,316 tons, compared with 13,504 in the corresponding period last year.

•

Refrigerator Sales Decline

Domestic sales of electrical household refrigerators during the month of February totaled 134,946 units, compared with 97,641 in January and 228,-

FROM ANY ANGLE

Hemingrays mean long *Trouble-Free* performance at moderate cost

Greater Leakage Distance *plus* the BRASS BUSHING!

● The modern design of HEMINGRAY Glass Insulators, Series-600, provides the greater leakage distance that assures outage-free performance at all times. The brass bushing means greater mechanical strength. The tougher glass means defiance to age and resistance to harder usage. The more accurately controlled manufacturing processes mean uniform production. These four advantages *together* mean unfailing service throughout the years at minimum cost. Send today for samples.

3 SIZES

TYPE 660...FOR VOLTAGES UP TO 8,000
TYPE 670...FOR VOLTAGES UP TO 10,000
TYPE 680...FOR VOLTAGES UP TO 15,000

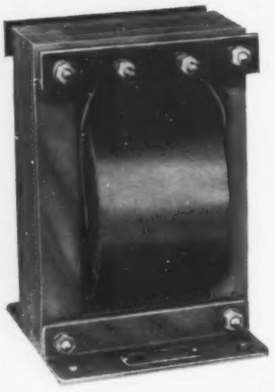
Handle most PRIMARY line requirements

World's largest manufacturers of glass containers; and producers of INSULUX Glass Block, DUST-STOP Replacement-Type Air Filters, FIBERGLAS Insulating Wool, Insulating Blankets and Filter Cloth.

Owens-Illinois Glass Company, "FIRST IN GLASS",
Hemingray Division, Muncie, Indiana.

FOR MODERN POWER LINE INSULATION

Order HEMINGRAY Glass INSULATORS



Special and Non-Standard
TRANSFORMERS
to YOUR SPECIFICATIONS

consult Ferranti on your requirements

Ferranti Electric Inc.
R.C.A. BUILDING, NEW YORK, N. Y.

for Low Cost Maintenance

"DIXIE"
POLES

CREOSOTED or "WOLMANIZED"

They're all dense longleaf yellow pine. Straight and strong. Uniform size. Properly graded. They take maximum penetration under vacuum-pressure. Four modern treating plants strategically located assure prompt deliveries on schedules of any size.

For quotations, address:

JACKSON LUMBER COMPANY
LOCKHART, ALABAMA
A CROSSETT WATZEK GATES INDUSTRY

532 in February, 1937, according to the report issued by the National Electrical Manufacturers Association covering sales to distributors and dealers. The bulletin is based on the reports of seventeen companies. World sales in February amounted to 148,726 units, compared with 106,862 in January and 245,614 units in February, 1937.

•

Manufacturers Make Sales Appointments

The following assignments have recently been made by electrical manufacturing companies to their sales staffs:

Square D Company has appointed R. A. Tibbetts manager of the Boston office, succeeding Richard P. Taylor. Mr. Tibbetts has for some years been sales engineer in the New England office of the company with headquarters in Boston. J. D. MacKenzie, formerly with the Cleveland office of the company, has been transferred to Boston as sales engineer.

Trico Fuse Manufacturing Company announces the appointment of the Industrial Power Equipment Company, Ft. Worth, Tex., to cover the state of Texas; Machinery and Equipment Sales Company, Baltimore, to cover Maryland and Walter J. Sciutti, Jacksonville, Fla., to cover Florida.

A. B. Chance Company-Tips Tool Company has opened an office in Chicago in charge of J. J. Milligan, district manager. He is being assisted by Stuart Walters. Mr. Milligan and Mr. Walters will represent the company in eastern Wisconsin, Illinois, eastern Missouri, western Kentucky, western Tennessee and Michigan.

Locke Insulator Corporation has announced the opening of a new sales office in New Orleans, La., in charge of H. J. Geiger. F. N. Reynolds, cable specialist located in General Electric's Philadelphia office, has joined the sales department with headquarters in New York.

Lawrence Jennings has been appointed regional supervisor of General Electric appliance sales to central stations. Mr. Jennings will be responsible for both specialty and household appliances and will contact holding companies and the larger operating companies.

•

Vacuum Cleaner Sales Drop

Electrical vacuum cleaner sales as reported by the industry for February totaled 100,412, compared to 151,264 in February, 1937, and 118,127 in January, 1938, C. G. Frantz, secretary of the Vacuum Cleaner Manufacturers' Association, has announced.

New York Metal Prices

	Mar. 30, 1938 Cents per Pound	April 5, 1938 Cents per Pound
Copper electrolytic	10.00*	10.00*
Lead Am. S. & R. price	4.50	4.50
Antimony	13.75	13.75
Nickel ingot	35.00	35.00
Zinc spot	4.65	4.65
Tin Straits	39.125	38.75
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.

PLAN FOR BETTER SEEING . . .

With Modern MERCURY LIGHT

In industrial buildings "designed for working" from the ground up, the lighting system has now become a primary element in the plans. Higher illumination values are vital to safety and efficiency in modern productive processes, but it takes keen foresight in design to achieve them economically.

Today, architects and engineers who plan new or modernized industrial buildings find modern MERCURY lighting a "way out" when high illumination and low operating costs must be combined. Even in high bay construction where the crane-way must be provided for, every square foot of floor area can be flooded with this economical light.

Why not plan for better seeing right from the start with MERCURYS alone or in combination with incandescents. Why not write for information to aid you in engineering these high-efficiency light sources to the job?

The 400-Watt MERCURY Lamp is 60 to 140% more efficient than other available light sources.

Order your auxiliary devices which were designed especially for this lamp from the General Electric Vapor Lamp Company.

GENERAL ELECTRIC

870H

General Electric Vapor Lamp Co.
805 Adams Street, Hoboken, N. J.

Incandescent Lamp Department
Dept. 165, Nela Park, Cleveland, Ohio

. . . for VOLUME in an untouched Mass Market . . .

Standard

No. 818

A QUALITY RANGE and the lowest priced for a commercial electric range . . .

(Also in white porcelain enamel)

Use No. 818 to add most desirable type of cooking load from

Drug stores
Barbecues
Drive-ins
Schools
Sandwich shops
Small clubs
Dine and dance places
Diet kitchens
Company cafeterias
Small cafes

Tap new sources of revenue with Standard No. 818—Speed, efficiency, flexibility (5 cooking top variations) allow maximum results from active promotion.

Standard's No. 800 Series covers the entire field of commercial cooking—also large homes and estates.

Mail coupon for details

Standard Electric Manufacturing Corp.
Toledo, Ohio.

Please send full details on

☐ Standard No. 818 load-building commercial range.

☐ Standard 800 Series heavy-duty ranges.

.....

.....

Field Reports on Business

While activity in the electrical industries continues under a year ago, there are signs of improvement. Some recovery has been made since January, with the possibility of further stimulation this spring. There has been an increase in inquiries, with some orders being placed.

NEW YORK

Indications that the steepness of the decline in business over the past few months is being arrested holds promise of a pick-up in the near future. There has been an increase in the number of inquiries concerning equipment.

The attitude of the SEC toward the utilities in carrying out the provisions of the utility act has renewed a certain amount of confidence, which is expected to grow. Adoption by the Senate finance committee of an easing of the capital gains tax, as applied to utilities in revamping systems, is considered a helpful step.

Long Island Lighting is soon to start a $300,000 office building at Mineola, in addition to other system construction. Installation of the new generator at the Greenwood Landing station is expected to be started in May. With the coming of warmer weather in this area utility construction is expected to be stimulated.

Electrical manufacturers report business under a year ago, but state that there are encouraging signs. Some phases of the business are moving ahead, while others remain slow. Westinghouse reports good marine orders.

There is a growing feeling among the more progressive managements that present conditions cannot last forever and they are making their plans with the view of obtaining a greater proportion of business in the future.

NEW ENGLAND

Business continues uneven in trend, with apparatus buyers in a waiting attitude pending tax relief legislation at Washington. A noteworthy recent sale, however, covered four Cottrell precipitators for Boston Edison's Edgar steam plant at North Weymouth. The Taunton Hospital is purchasing $1,500 worth of electric fixtures and is receiving bids on air-condition equipment. Boston City Hospital is in the market for electric signaling equipment. Watertown Arsenal is asking for bids on an X-ray set and on 7,000 lb. of ⅛-in. and 18,000 lb. of 5/32-in. welding electrodes. A manufacturer of small steam turbine units reports good activity in his shops, but electric motor sales are dull and fragmentary.

Recent meetings stressing safety aspects of highway lighting attracted wide interest and may lead to more sales of modern units, at least on a piecemeal basis. Interest in store-front lighting improvements is unusually active for this season of the year, and electric sign installations are being made in downtown Boston and suburban business areas with good effect. Scattered interior wiring installations are being made and the Federal Housing Authority reports an increasing interest in applications for suburban homes, with a trend toward the use of more and more electric service. In line with the construction of its new departmental building for architectural research and instructions the Massachusetts Institute of Technology placed an order for about 185,000 ft. of cable and wire ranging from 1,000,000 circ.mil to No. 14. Transformer units aggregating 750 kva. have also been bought for institute use. A group of Vermont utilities reports the movement of 60 electric refrigerators, compared with 21 the week before.

CHICAGO

A few more inquiries were received this week by electrical manufacturers than were forthcoming during the past few months. This modest improvement may only be recognition of seasonal dictates, but, coupled with the general pick-up shown recently, might easily signify definitely rising tendencies. Unfortunately, the behavior of the stock market has a tendency to cast gloom over the entire picture, depriving other developments of their inherently constructive contribution.

Wholesale and retail trade has held up fairly well for two or three weeks, showing a marked gain over the previous month. Some industries, notably steel, have improved their position to an encouraging degree. A prominent manufacturer of electrical appliances reported a sales increase of 61 per cent for the first quarter as compared with a year ago. Commercial lighting sales are making a good showing and the demand for portable lamps is good. A large volume of street and highway work is in progress, increasing the demand for street and traffic lights. The use of sodium-vapor lamps at large intersections is becoming more prevalent.

The amount of new building construction is discouraging, the volume last month falling 74 per cent below a year ago. However, outside the metropolitan area the situation is reversed, substantial gains being made.

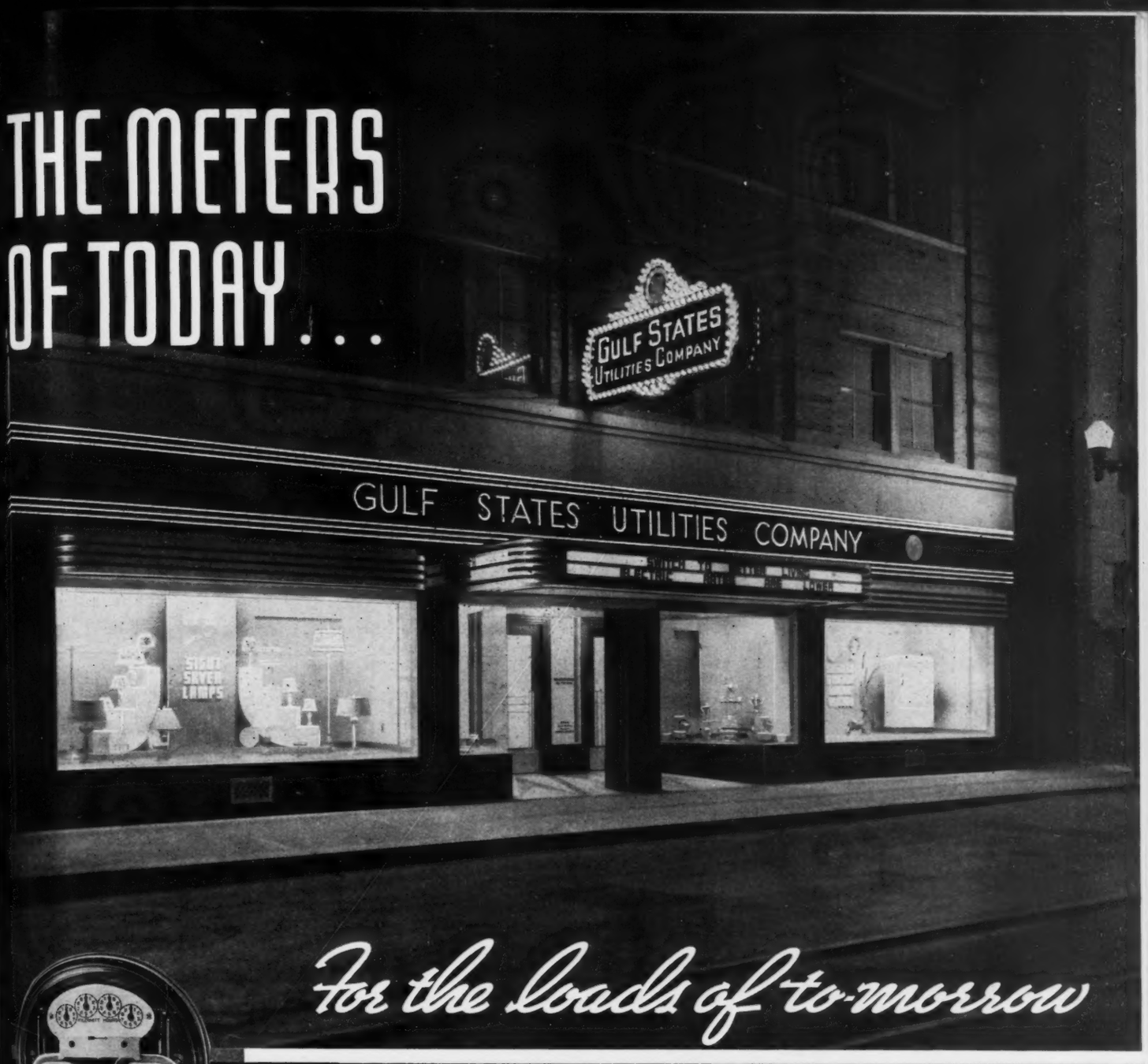
SAN FRANCISCO

Coast electrical business improved perceptibly during the latter half of March, especially in California, where building is seven weeks behind schedule due to rainfall, and although the quarter's volume is about a third less than last year's, belief is widespread that upturn will continue.

Power company purchasing in the San Francisco area includes a 1,000-kva. substation, equipment valued at $15,000 for the Coast Counties and $14,000 of transformers for exposition service, together with preliminary floodlights totaling $2,500 and $4,000 of cable for the same purpose, and a carload of high-tension glass insulators, value $9,500, for the city. Similar business in the Los Angeles area included a carload of guy strand, principally ¼ and 5/16 in. sizes; 130,000 ft. of copper tubing, principally ¾ and 1 in.; an order for $12,000 Moloney transformers; a bid for 20,000 gal. of turbine oil for pumping plants, and 45,000 ft. assorted high-tension cable for Pasadena, with 500,000-circ.mil, three-conductor, 2,300-volt as an outstanding item.

March collections were good with no relaxation of the vigilant watchfulness adopted for the year. Dealers report a fair public response to opening campaigns in major appliances, but 1939 designs will prove a problem when added to the 1938 design carry-over.

THE METERS OF TODAY...



For the loads of to-morrow

A MODERNLY designed, eye-appealing store front which keeps abreast of the times is a valuable asset in any merchandising plan.

Modern meters, too, are a valuable asset. During the past two years a complete line of single disk two-element meters has been developed. These meters are available in various forms to meet requirements from singlephase 3-wire, to 3 or 4-wire 3-phase and 4-wire delta circuits.

Thus, these modern meters not only have kept abreast of the times, but also anticipate the metering requirements of the commercial and industrial loads of to-morrow.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

THERE IS AMPLE

ROOMINESS in Highway BODIES

DESIGNED ESPECIALLY FOR UTILITY SERVICE

Efficently designed to utilize every unit of space. Accessibility is a feature. There is no crowding—no confusion. Roomy crew quarters means comfort and safety. Highway Bodies are lightweight, yet rugged. They are dependable every mile of the way. They save money for you over largest service periods.

Highway makes a complete line of bodies for Central Station line construction and service trucks. Send for Bulletins—read the details.

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

Municipal Plants

CLINTON, MICH.—With the present municipal light plant showing a profit of $10,000 for 1937, but needing repairs which will cost an approximate total of $87,120, the town is faced with the proposition of buying the equipment, or selling the properties. Possibilities of a new municipal plant are also being considered, with final decision in the matter expected at an early date.

THAYER, MO.—Town won a court test involving its right to erect a municipal light plant. Taxpayers, including the Arkansas-Missouri Power Corporation, which serves the city, instituted a suit against the town and Fairbanks, Morse Company. The plaintiffs sought an injunction to prevent erection of the plant. Judge Thomas Martin of Barton County Circuit Court ruled in favor of the defendant.

YORK, NEB.—Voters have approved by a plurality of 282 a $475,000 revenue bond issue for the purpose of acquiring a municipally owned light plant and distribution system. The unofficial complete returns showed 1,455 in favor of the bond issue and 1,173 against. The bonds will be secured by earnings from the municipal system. An engineer's report fixed $475,000 as the maximum required for construction of a generating plant and distribution system, but it was pointed out expenditure of the sum will be necessary only if the council is unable to negotiate a suitable contract with the Iowa-Nebraska Light & Power Company, or one of the hydro-electric districts for purchase of power. York is now being served by the Iowa-Nebraska company.

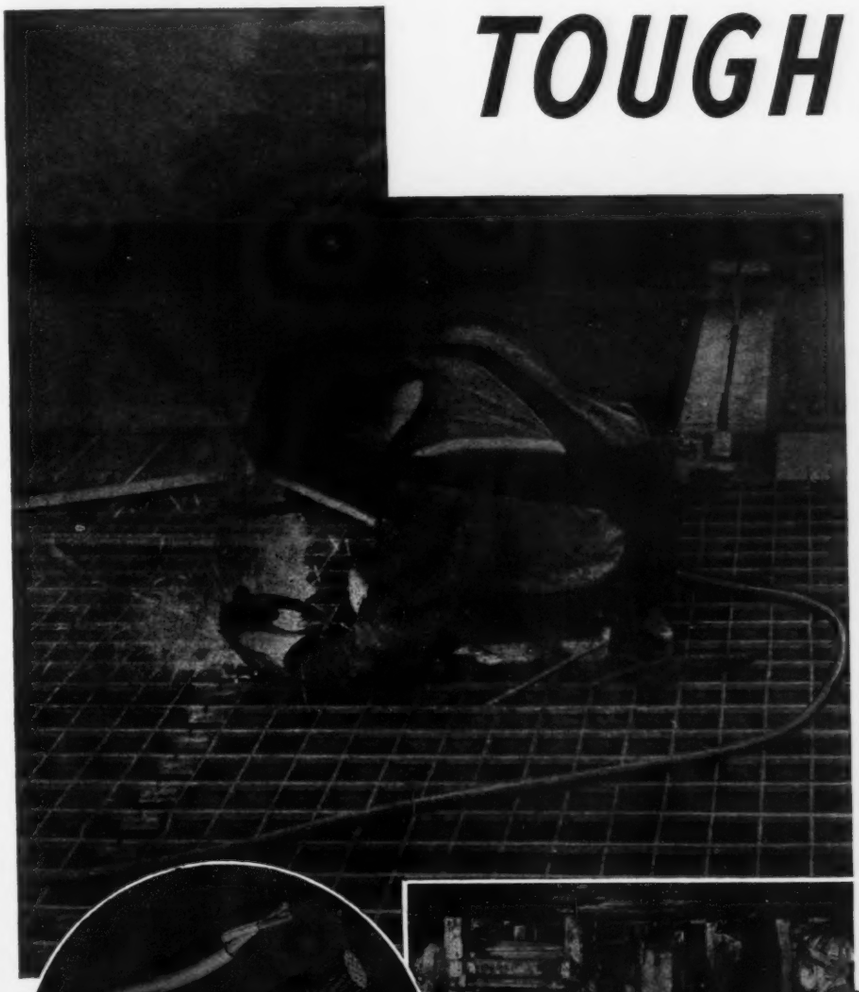
DESHLER, NEB.—State Supreme Court has denied a rehearing sought by the village, which lost a suit to eject the Southern Nebraska Power Company on the ground it had no valid franchise.

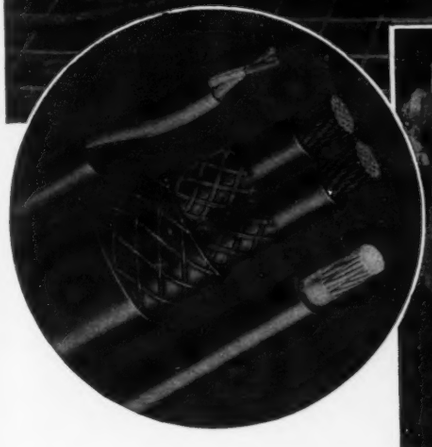
COLUMBUS, NEB.—Proposed construction or purchase of a municipal electric distribution system was upheld recently in Columbus by Judge Frederick L. Spear. The decision was in a case brought by Fred Drummond of Columbus, who asked an injunction to halt a proposed $250,000 revenue issue by the city for the purpose of acquiring such a power system. Northwestern Public Service Company was an intervenor in the case. Judge Spear said in the memorandum opinion that no injunction should be issued because it appears the revenue bonds when issued will be valid. He also held that the law under which the proposed bonds would be issued is constitutional. Upheld also was the petition for the bond election. Judge Spear held submission to the voters to buy or build is not a dual proposition in the intent of the law. The city had voted on the proposition in 1936.

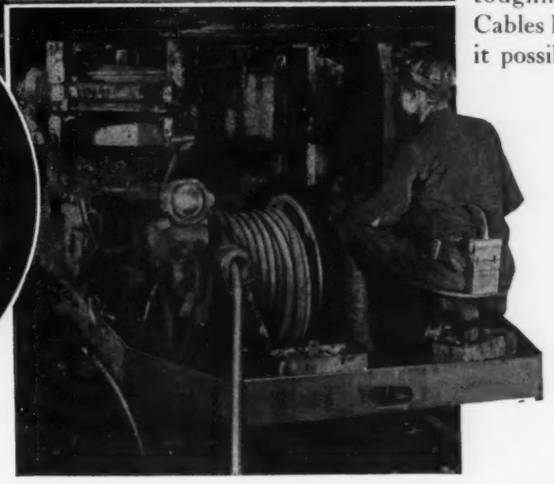
PLATTSBURG, N. Y.—Problems incident to the establishment of a municipal power plant were aired recently before the Appellate Division in Albany. The federal government through PWA is willing to loan 55 per cent of the minimum cost and grant the city the remaining 45 per cent. Although the question before the court at present is only an appeal from a temporary injunction, which restrains the city from proceeding, the case raises several far-reaching issues which have not yet had a court test. Opposing the proposed plant is the New York State Electric & Gas Corporation, in a taxpayer's action, on the ground the project would be a waste of public funds. Wallace E. Pierce,

TOUGH *they have to be . . . and*

TOUGH *they are!*







IF YOU use electrical Cords and Cables you will find it worth your while to investigate Amerclad All-Rubber Cords and Cables. For whatever your requirements may be you will find that they are within the Amerclad range. You will find, too, that Amerclad All-Rubber Cords and Cables will always meet your electrical needs with complete satisfaction and economy.

Amerclad construction consists of one or more conductors encased in a protective sheath of tough, resilient rubber. It is this tough protective covering that gives added life to Amerclad Cords and Cables. It resists rough treatment, oil, water, and abrasive wear . . . it withstands the rigors of heavy duty which are particularly destructive to portable cords and cables. Yet, with their extra toughness, Amerclad Cords and Cables have the flexibility that makes it possible to move them from place to place with ease.

Amerclad All-Rubber Cords and Cables are made by the American Steel & Wire Company, manufacturers of a complete line of Electrical Wires and Cables. When you order "Amerclad" you get the quality that is based on more than a century of wire-making experience. Send for our catalogue.

AMERCLAD *All-Rubber* CORDS AND CABLES

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Much has been said about the desirability of lower prices in the economic structure. It has always seemed to me that the Western Electric-Bell System relationship offers one interesting solution of this problem.

PRESIDENT

In the Public Interest

If a business did not need to seek or promote its market,

If its customers were fellow members in the same corporate system,

If their orders were consolidated so that economical production could be achieved,

Then—manufacturing could be conducted most efficiently and sales made without selling expense and without credit loss.

That exactly describes Western Electric's position in the Bell System, and the economies resulting from this arrangement are passed along to the telephone companies in the form of lower prices.

Thus Western Electric contributes its part in making Bell telephone service economical, and justifies its place in the Bell System as in the public interest.

Western Electric

BELL SYSTEM SERVICE

IS BASED ON

WESTERN ELECTRIC QUALITY

counsel for the company, said the case will raise the question of whether revenue bonds should be included in determining the city's constitutional debt limits and whether the state law enabling cities to participate in the federal recovery program prevents institution of taxpayers' actions against projects financed by the government on the ground "an emergency exists?" Mr. Pierce contended the city would exceed its debt limit, and that no emergency justified suspension of the constitutional right to bring suit if a taxpayer feels aggrieved. Corporation Counsel Kehoe argued the law specifically states revenue bonds shall not be computed in determining the debt limit.

ELECTRA, TEX.—Recent election held on the proposal to issue $122,000 of bonds, to be added to $320,818 of federal funds, for construction of a municipal electric light and power plant resulted favorably with a vote of 504 for and 97 against. Of the federal funds, $99,000 is an outright grant.

PROVO, UTAH—Brief in support of its petition for a rehearing in the power plant case has been filed with the Supreme Court by the Utah Power & Light Company. The company is seeking to prevent Provo from going ahead with its plans to build a municipal power plant and sell $350,000 of special revenue bonds to finance construction, claiming the plans of the city will result in violation of the constitutional debt limitation. Last December the Supreme Court handed down its decision in which it denied the power company's application for a writ of prohibition against the city, and gave Provo the right to go ahead with its plans.

SOUTH NORFOLK, VA.—In a brief session held recently, and with no further debate on the proposal, City Council unanimously overrode Mayor James J. Davis' veto, thus putting into effect a ten-year contract with the Virginia Electric & Power Company and ending a three-year-old controversy over the building of a municipal electric plant. Mayor Davis vetoed the Council's previous approval of the contract in February.

PLAIN, WIS.—Wisconsin Public Service Commission has authorized residents to vote on selling the municipal electric plant to the Wisconsin Power & Light Company for $50,000, if the sale is approved.

WHITEHALL, WIS.—Citizens will vote in special referendum at an election on April 15 on whether to purchase the property of the Northern States Power Company. Until 1920 the village operated its own generating plant.

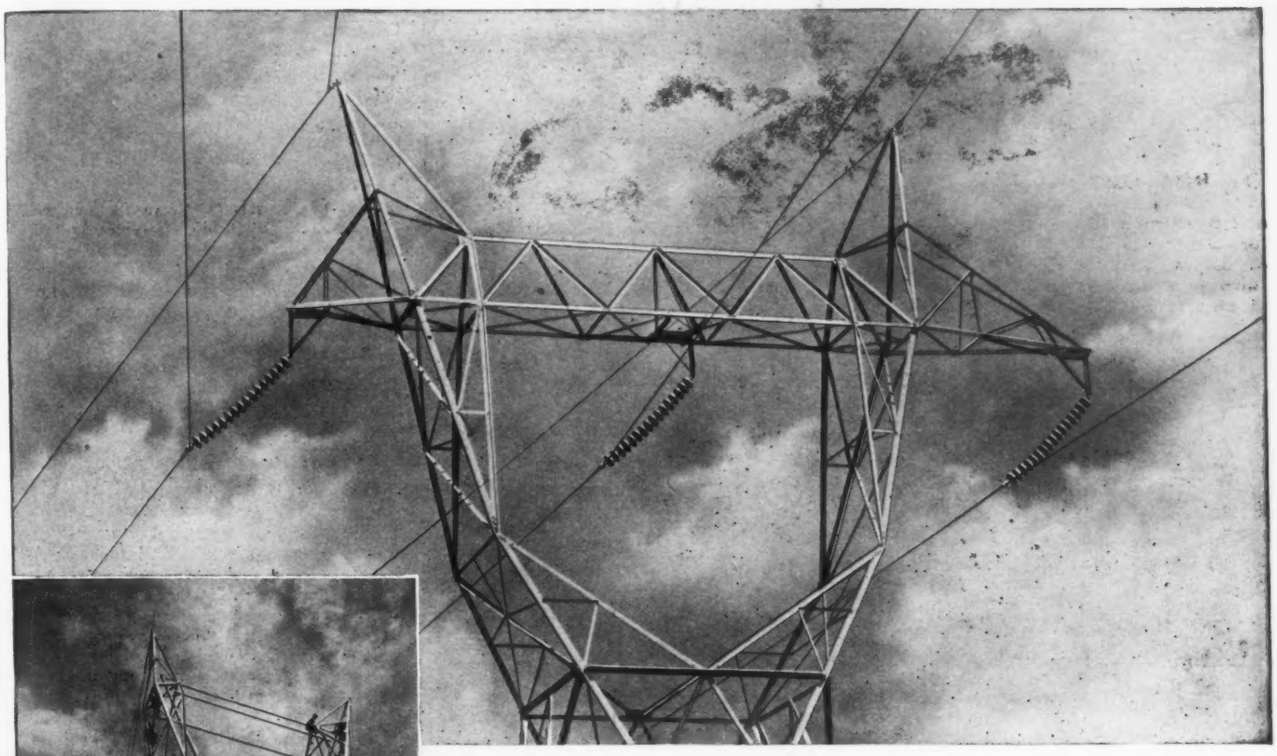
•

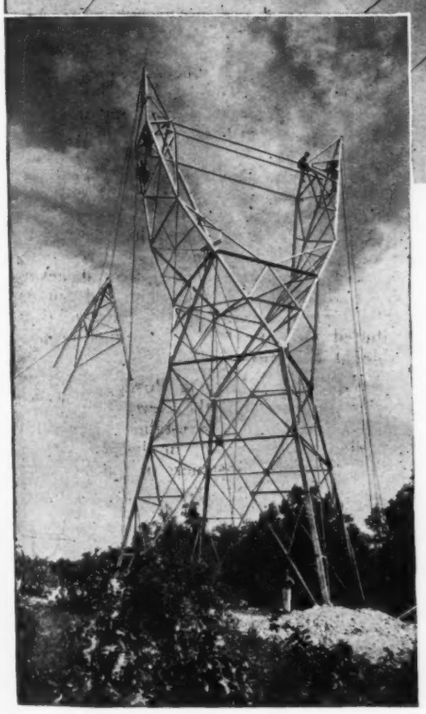
Oklahoma Rate Hearing Set

Federal Power Commission has ordered a hearing held on April 18 on the commission's suspension, through an order adopted February 2, of the rate schedule filed by the Oklahoma Gas & Electric Company under a proposed new agreement with the Public Service Company of Oklahoma and the Southwestern Light & Power Company covering the sale and interchange of firm, excess, dump and emergency electric energy among the three companies. The commission suspended the schedule until May 2.

MODERN TOWERS

for Modern Transmission Requirements





LONG Distances, High Voltages, and the modern need for absolute dependability of electric power transmission are making transmission tower design increasingly more important. To exactly suit American Bridge Towers to their purpose, design is carefully considered from these varied viewpoints.

What is the character and accessibility of the terrain?

Will the tower provide effective insulation for the specified voltages?

What are the stresses that the service entails and is there adequate strength to withstand these?

How easy and economical will the tower be to erect?

In all towers designed by American Bridge, cross-arm frames and shafts are clean cut, with a minimum number of parts and complete absence of complicated connection details. Members are shipped in longest practical lengths with splices most favorably located for speedy erection and the least possible field handling.

It is true economy to specify "Towers by American Bridge." Write us about your next need.

AMERICAN BRIDGE COMPANY

General Offices, Frick Building, Pittsburgh, Pa.

Baltimore · Boston · Chicago · Cincinnati · Cleveland · Denver · Detroit
Duluth · Minneapolis · New York · Philadelphia · St. Louis

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* • United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

THIS LOCKING UNIT

The Bendix-Cory Locking Unit is a key-actuated bolt mechanism designed for use on oil circuit breakers, disconnecting switches or other types of switchgear.

Type B-3003

WILL SAFEGUARD YOUR SWITCHGEAR

Protected from accidental mis-operation, your electrical circuits are positively key-controlled when Bendix-Cory Locking Units are built into the switchgear.

When these units are used in conjunction with blocking segments, rods, plates or other auxiliary adapter mechanisms, an effective interlock is created.

While primarily intended for switch manufacturers, the Bendix-Cory Locking Unit also fulfills the requirements of users of Interlock systems who prefer to fabricate a portion of their Interlock equipments.

Write for complete information.

BENDIX-CORY

MANUFACTURED BY **BENDIX MARINE PRODUCTS CO., INC.**
(Subsidiary of Bendix Aviation Corporation)
754 LEXINGTON AVE. BROOKLYN, N. Y.

Recent Rate Changes

KANSAS CITY POWER & LIGHT COMPANY has been ordered by the Missouri Public Service Commission to reduce its electric rates $1,000,000 a year, effective May 1. About $400,000 of that saving will go to residential consumers. Chester C. Smith, vice-president of the company, stated a similar reduction would be made effective to Kansas consumers with savings to them of about $75,000 a year.

NORTHERN STATES POWER COMPANY has been ordered by the Wisconsin Public Service Commission to reduce rates for 2,000 industrial power users $35,000 annually. The reduction will be in addition to a recent $52,000 cut for certain customers.

MISSOURI UTILITIES COMPANY has filed with the state Public Service Commission a new electric rate schedule, covering a 10.93 per cent reduction. Consumers in 27 towns would save a total of $21,600 annually if the commission approves the application.

INDIANA PUBLIC SERVICE COMMISSION has approved petitions for a reduction of residential and commercial electric light rates by both the Indiana Service Corporation in Fort Wayne and the City Light and Power Works. The reduction is from 4 cents a kilowatt-hour to 3½ cents on the first 60 kw.-hrs. used.

IOWA-NEBRASKA LIGHT & POWER COMPANY has announced an additional reduction in electric rates to effect generally the rate structures in the company's outside districts, exclusive of Lincoln. No change in rates was instituted in Lincoln, company officials explained, because the Lincoln rate schedules are comparable to the new rates just announced throughout the properties for the outside districts. "This rate reduction," stated L. R. King, president of the company, "will cost the Iowa-Nebraska Light & Power Company approximately $200,000. While materials, wages, taxes, equipment and other costs of operation have been increased generally, additional consumption and anticipated increase has substantially contributed to make this rate reduction possible at this time."

OSWEGATCHIE LIGHT & POWER COMPANY has been ordered by the New York Public Service Commission to establish new rates for electric service on or before May 1 which will save consumers of the company about $14,000 annually.

•

Fights Utility Ordinance

Minneapolis City Council public utilities committee has deferred action to April 11 on the so-called Wallace ordinance which would require the Minneapolis General Electric Company to pay $500 a route-mile for the use of streets for transmission lines. Definite opposition to the measure has been voiced by the Minneapolis Builders Exchange and by Neil M. Cronin, attorney for the utility company. Mr. Cronin told the committee that in his opinion the ordinance was invalid and was discriminatory because it singled out the electric utility from among all the utilities.

AFTER SAVING LIVES WITH LIGHT

DETROIT ORDERS 850 MORE *Westinghouse Reflectolux*

Reflectolux Sr. Luminaires provide complete night driving safety on this Detroit thoroughfare because automobile drivers are able to see dangers ahead in time to avoid them. Test blocks on the street illustrate how hazards stand out for the driver in sharp silhouette in contrast to the surface brightness of the pavement beyond.

The Westinghouse Reflectolux Sr. that has proved so successful in reducing night fatalities in Detroit. This unit is designed for lamps up to 750 watts or 15,000 lumens.

Detroit's achievement in reducing night traffic fatalities has proved that increased visibility for the automobile driver is an absolute necessity. After a year's successful experience with newly-designed street lighting units that provide adequate visibility, Detroit now orders 850 more Westinghouse Reflectolux Sr. Luminaires for an expanded program of nighttime safety.

Detroit's street lighting modernization is based on one of the most thorough traffic surveys in the country. And wherever the new luminaires have been installed, the rate of night traffic deaths has been lowered. Detroit has adopted in Reflectolux a wholly new concept of light utilization that provides a sheen of brightness on the street surface so that pedestrians or other hazards stand out clearly in silhouette to the automobile driver.

The Westinghouse Reflectolux Luminaire provides night visibility conditions comparable with daylight. Reflectolux has a combination of new features — more light on the street surface — less glare — less maintenance — unexcelled flexibility and durability — that make it a leader in any campaign to save lives in night traffic.

For complete details on Reflectolux, ask your local Westinghouse Lighting Specialist for the new book, SAFETY WITH LIGHT; or address Westinghouse Electric & Manufacturing Co., Lighting Division, Edgewater Park, Cleveland, O.

WHEN YOU THINK OF *Lighting Equipment* THINK OF

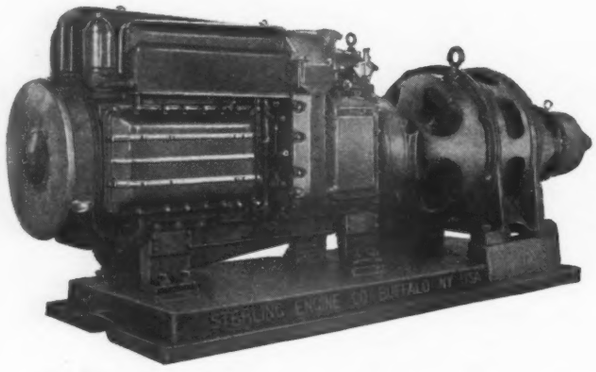
Westinghouse

DIESEL ENGINES
On The STERLING Principle
RUN LONGER
Without The Need of Servicing!

STERLING HIGH DUTY

Sterling — THE ENGINE OF REFINEMENT

INTERNAL COMBUSTION ENGINES



135 H.P. continuous—150 H. P. maximum—
1200 R.P.M. continuous service Diesel

There are no valves to grind; no cylinder heads to crack, or to make cold starting difficult; no crankshaft nor multiplicity of bearings to require attention!

The catalog and recommendations will be mailed you promptly, when you tell us how much power is required.

Gas—Gasoline—Diesel—Engines

STERLING ENGINE COMPANY

Home Office and Plant,
1270 Niagara Street,
Buffalo, New York

Dept. C-2

Branch Office,
900 Chrysler Bldg.
New York, N. Y

Sales Opportunities

PENSACOLA, OKLA.—Grand River Dam Authority of Oklahoma, City Hall, Vinita, Okla., is completing plans and surveys, and will take bids to close about April 19 for new 14-mile transmission line to site of main power dam on Grand River, near Pensacola, for power supply for construction service, including power substation at dam site. Plans also are maturing for main dam construction, power house, hydraulic turbines, generators, gates, gate hoists and auxiliary equipment, to be ready for distribution to bids on or about May 1, with bids to close approximately one month later. Entire project will cost about $20,000,000. Financing has been arranged through Federal aid. Holway & Neuffer, 302 East Eighteenth Street, Tulsa, Okla., are consulting engineers.

ITHACA, N. Y.—New York State Electric & Gas Corporation, Ithaca, plans extensions in primary and secondary lines for rural electrification in group of about 33 counties in Northern New York, with power substation and service facilities, totaling close to 245 miles in all. Work is scheduled to be carried out in 1938. Fund of $250,000 has been arranged through Federal aid to defray part of cost of project.

FRASER, IOWA—Fort Dodge, Des Moines & Southern Railroad Company, Boone, Iowa, has begun extensions and improvements in steam-electric power plant at Fraser, to include installation of additional equipment.

DETROIT, MICH.—Carboloy Company, Inc., 2985 East Jefferson Street, manufacturer of metals for tool inserts and allied service, plans new three-unit electric-operated plant on local site, totaling about 138,000 square feet of floor space. Cost about $500,000. Bids will be called soon on general contract. Smith, Hinchman & Grylls, Marquette Building, Detroit, are architects and engineers.

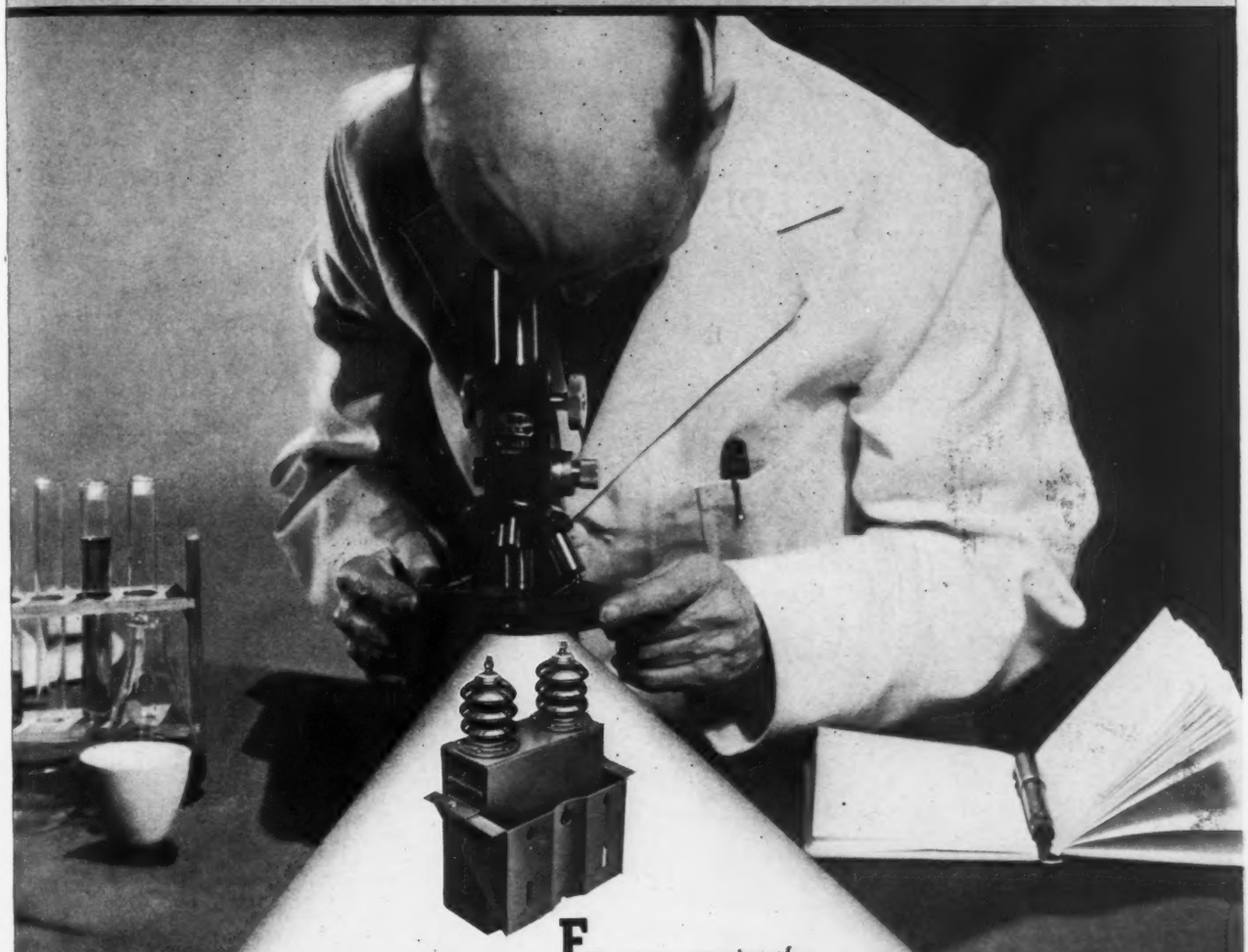
JACKSON, TENN.—Will ask bids soon for new municipal electrical distributing system, including main transmission line for connection with high-tension system of TVA, from which service will be secured, and three power substations, with transformers, switchgear and auxiliary equipment. This will comprise first section of system and is estimated to cost about $135,000. Entire project will cost about $660,000. Freeland, Roberts & Company, Nashville, Tenn., are consulting engineers. This item was published under Jackson, Miss., in the March 26 issue of ELECTRICAL WORLD, in error.

LA CROSSE, WIS.—Northern States Power Company, Eau Claire, Wis., has concluded arrangements for purchase of site on French Island, La Crosse, for new steam-electric generating station. No date for beginning construction has as yet been determined. Project will include construction of transmission line for connection with present system. Cost reported close to $1,500,000.

HOBOKEN, N. J.—General Foods Corporation, 250 Park Avenue, New York, N. Y., plans installation of motors and controls, regulators, conveyors, electric hoists and other equipment in new one and multi-story food products plant at Hudson and Twelfth Streets, Hoboken, where large site has been acquired. Work is scheduled to begin soon. Cost about $1,000,000.

ROCK ISLAND, ILL.—People's Power Company, Moline, Ill., will begin superstruc-

FOCALIZATION



For over a quarter of a century, the combined effort and ingenuity of Cornell-Dubilier has been *focussed* on the production of capacitors — and capacitors alone.

This focalization of research and manufacturing experience is directly responsible for the production of dependable capacitors.

Non-inflammable and non-explosive, these modern C-D's are built to withstand any and all climatic conditions. Today, Cornell-Dubilier capacitors for power-factor improvement offer the same high quality, long life and built-in dependability engineers the world over associate with C-D Dykanol capacitors.

Literature on request at Department D9 - 1032 Hamilton Boulevard., South Plainfield, New Jersey

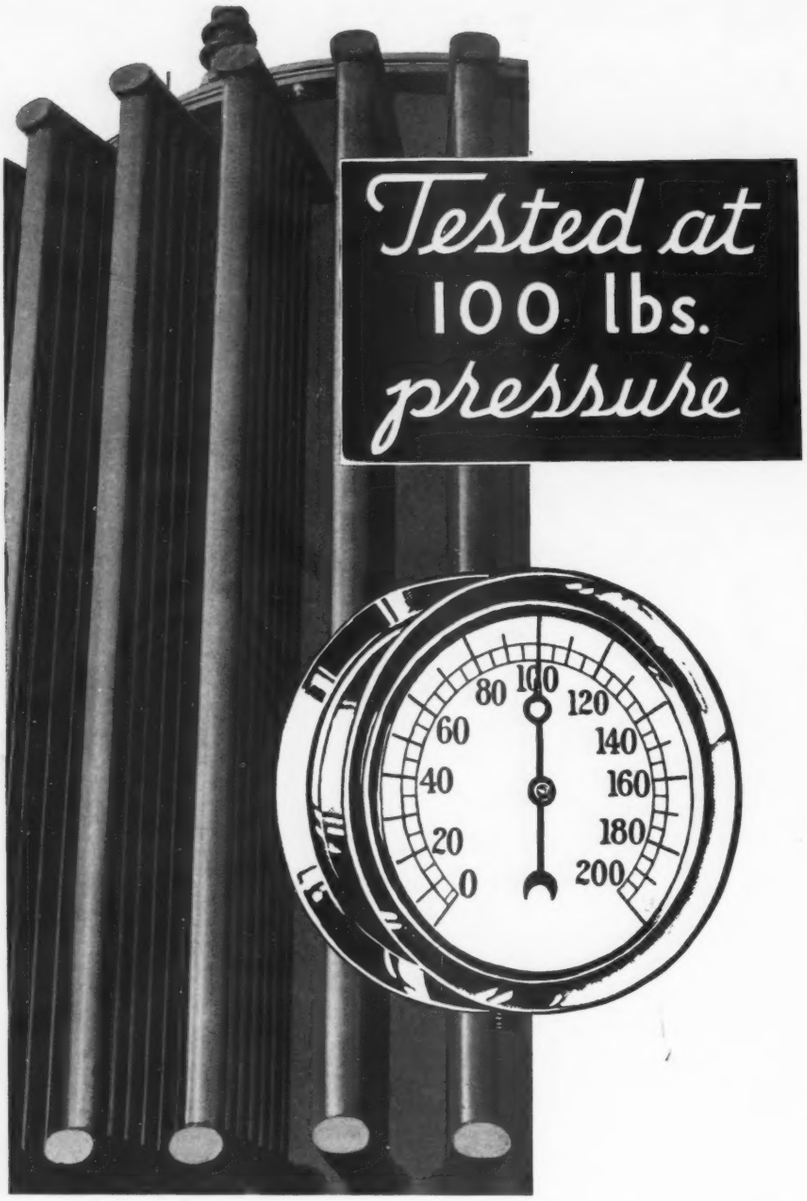
UTILITIES ARE FINDING IN CORNELL-DUBILIER POLE-TYPE CAPACITORS THE ANSWER TO THE PROBLEM OF INCREASING SYSTEM CAPACITY ECONOMICALLY.

CORNELL-DUBILIER ELECTRIC MANUFACTURING EM

CORNELL-DUBILIER

WORLD'S OLDEST AND LARGEST MANUFACTURERS OF CAPACITORS EXCLUSIVELY

Capacitors for Power-Factor Correction



ONE hundred pounds per square inch is the standard pressure test for all radiators of Pennsylvania Power Transformers, an evidence of their greater strength. This is due to the heavy wall, 13-gauge steel tubes and the rugged weld which only heavy gauge metal permits.

The radiators are permanently welded to tank and so spaced that each tube is readily accessible for sand-blasting, cleaning and painting in factory or field. It is such painstaking attention to constructional details that make Pennsylvania Transformers ever dependable and highly economical.

Representatives in Principal Cities

PENNSYLVANIA TRANSFORMERS

Pennsylvania
TRANSFORMER COMPANY
1701 ISLAND AVENUE, N. S., PITTSBURGH, PA.

ture soon for new two and three-story service and operating building at Fourth and Eighteenth Streets, Rock Island, 80x 120 feet, with meter and meter repair divisions and other departments. Cost about $235,000, with equipment. Contract for building erection has been let to Stoehr & Palmgren, 2129 Sixteenth Street, Moline.

BOSTON, MASS.—Boston Edison Company has filed plans for extensions and improvements in switching station at 776 Summer Street, including installation of equipment.

HARTFORD, CONN.—Connecticut Power Company has plans under way for extensions in transmission and distributing lines in different districts, including Housatonic and Farmington Valley areas, with additional power substation and service facilities. Work will be carried out in 1938. Cost over $150,000.

HUNTINGTON, W. VA.—International Nickel Company, 67 Wall Street, New York, N. Y., plans installation of motors and controls, conveyors, electric hoists and other equipment in connection with extensions and improvements in metal refining plant and mill at Huntington. Cost estimated close to $300,000.

KNOXVILLE, TENN.—Plans early call for bids for different parts of project for municipal electrical distributing system, including overhead distribution lines in District No. 1 (Contract 3); unit substation equipment (Contract 4), and main power substation equipment (Contract 5), with transformers, switchgear and accessory apparatus; main substation building (Contract 6); watt-hour meters, etc. (Contract 7); distribution transformers and accessories (Contract 8); overhead distribution lines in Districts 3 and 4 (Contract 9); underground conduits and distribution lines (Contract 10); network transformers and protectors (Contract 11), and office and warehouse buildings (Contract 12). As noted, Contracts 4, 5, 7, 8 and 11 are for equipment only, as will be specified in detail when bids are called. Entire project will cost about $2,500,000. Financing has been arranged through Federal aid. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

TRENTON, N. J.—Pennsylvania Railroad Company, Philadelphia, Pa., has plans nearing completion for extensions in electrification system from present main line at Trenton to Coalport Yard freight branch-off in East Trenton, extending from Southard Street bridge to Hamilton Township. It is proposed to begin work in April.

BALTIMORE, MD.—City Council and Baltimore Transit Company plan construction of a joint pole line on part of Howard Street, extending from new viaduct to North Avenue, for combination electric power lines and traction feeder lines.

NEW HAMPTON, IOWA—Plans extensions and improvements in municipal electric power plant, including installation of additional equipment. Cost estimated close to $100,000. R. W. Gearhart, 349 21st Street, S. E., Cedar Rapids, Iowa, is consulting engineer.

KANAWHA CITY, W. VA.—Appalachian Electric Power Company, Roanoke, Va., has approved plans for new power substation at Kanawha City, and will proceed with erection at once. Work also is being started on a new service and operating building at Beckley, W. Va. Both projects will cost over $200,000.

Philadelphia Association Sponsors Electric Exhibit

Progress in the electrical industry is the theme of the electrical exposition to be staged in Convention Hall, Philadelphia April 18-23 by the Electrical Association of Philadelphia. The latest developments in radios, refrigerators, ranges, washing machines, air conditioners, ironers, dishwashers and vacuum cleaners will be shown. "We plan to make the Electrical Exposition a memorable occasion," said George R. Conover, managing director of the association, "and exhibitors are assured that every facility will be utilized for making possible the most effective presentation of their products."

Mayor S. Davis Wilson has issued a proclamation calling upon the people to join in attending and furthering the success of this exhibition.

•

War Department Contracts

The U. S. War Department through the U. S. Engineer's Office, Rock Island, Ill., has awarded contract for the construction and instaliation of a power, control and lighting system for Lock and Dam No. 13, Mississippi River, near Clinton, Iowa, to the Dearborn Electrical Construction Company, Chicago, at $107,800. Other contracts recently awarded by the U. S. Engineer's office were to Century Electric Company at $3,842 for furnishing five lock gate and valve operating motors and to Cutler-Hammer, Inc., at $771 for furnishing four brake motors and six brake drums.

•

Plans Dam and Power Plant

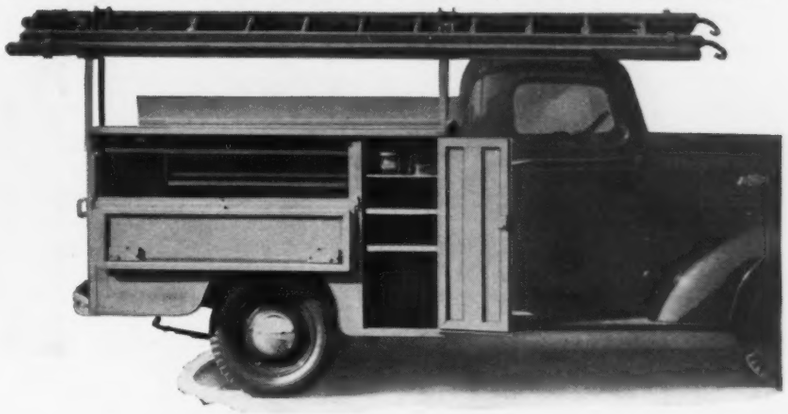
Anglo-Canadian Pulp & Paper Mills, Ltd., Quebec City, intends erecting a dam and power plant in the Saguenay region. A petition has been forwarded to the Quebec Department of Lands and Forests asking for permission to build a dam, to be known as the Forestville Dam, at the head of the First Falls at the mouth of the Sault au Cochon River at Forestville and a canal immediately above the dam to be the starting point of the penstock of the proposed power plant and of the flume which will carry logs to loading point.

•

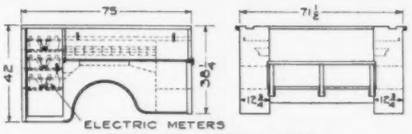
Line Transfer Permitted

Transfer of a 19-mile electric transmission line in southern Allegany and Cattaraugus counties, New York, near the Pennsylvania state line, from the Rochester Gas & Electric Corporation to the New York State Electric & Gas Corporation, for the price of $34,444, has been approved by the Public Service Commission.

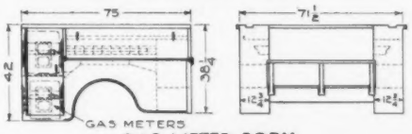
THE BIGGEST PACKAGE WE HAVE EVER OFFERED FOR THE MONEY



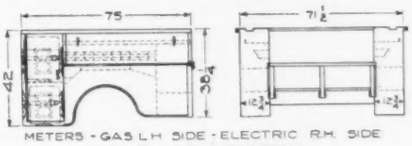
WITH THIS UNIVERSAL PUBLIC UTILITY BODY designed to meet four separate service requirements, we can offer a price based on the manufacture of 1000 units. For each service it is the most adaptable and efficient body ever designed.



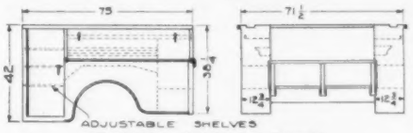
ELECTRIC METER BODY



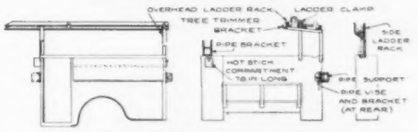
GAS METER BODY



GAS AND ELECTRIC



GENERAL SERVICE BODY



OPTIONAL EQUIPMENT

The 4460 body has not only the most compartment space ever incorporated on any similar body (39 cubic feet) but has a 46 inch wide floor of 24 square feet area for bulk loading.

The door openings are the same on both sides. The partitions in the side boxes are removable and the shelves in the forward boxes are fully adjustable for height.

Hot sticks are carried on the top shelf of a side box and are removed from the rear of the body. If longer hot sticks are carried an optional compartment is supplied.

Adequate provision is made for the loading and protection of electric, gas, or water meters as the service requires.

The fenders are incorporated in the body saving the purchaser the additional cost of chassis fenders.

Electric meters of the conventional or socket type are set on moulded rings and held in position by rubber straps as shown. The shelves are removable and fully adjustable for height.

• QUOTATION UPON REQUEST

THE AMERICAN COACH & BODY CO.
CLEVELAND, OHIO

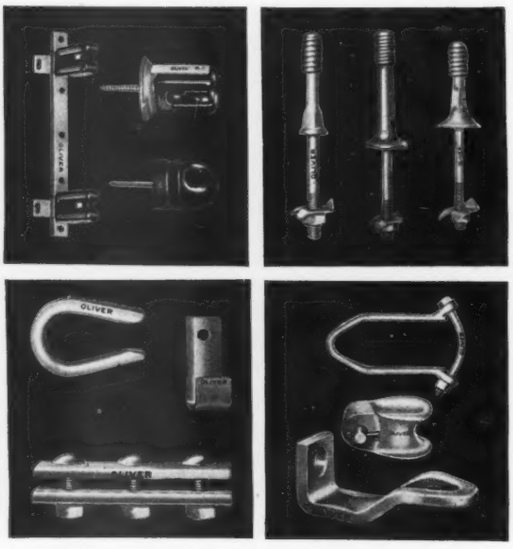
OLIVER

Pole Line Material

PERFECTED PRODUCTS OF OVER FORTY YEARS OF ENGINEERING AND RESEARCH

Accepted and specified by the Leaders since 1894

On sheer merit alone, Oliver Pole Line Materials have commanded the preference of leading engineers throughout the electrical industry—merit that is measured by an exacting standard of workmanship and progressive design founded on more than 40 years of experience.



SIC ESTABLISHED 1863

OLIVER IRON AND STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

OLIVER POLE LINE MATERIALS

APPROVED AND ACCEPTED SINCE 1894

OLIVER

Bay State Plants Attack Chimney Discharge Problems

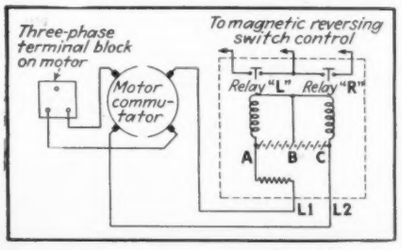
[*Continued from page 44*]

This is a problem in economics and later will be subject to considerable study and probably some tests of recovery use.

Problems at Lynn

In 1935 it was decided that it would soon be necessary to have additional steam capacity in the generating station of the Lynn company. At that time there were installed two B. & W. stoker-fired boilers, generating steam at 400 lb. pressure and each capable of producing 150,000 lb. of steam per hour; also seven stoker-fired boilers, generating steam at 200 lb. and with a combined rating of 183,700 lb. of steam per hour. The 200-lb. boilers are quite old and not used in normal operation.

In considering the purchase of a new 400-lb. boiler it was decided to take advantage of the economics resulting from use of a lower grade of fuel, consequently a Riley pulverized fuel boiler was purchased. This boiler is a four-drum design with bent tubes, producing 205,000 lb. of steam per hour, with steam temperature of 775 deg. at superheater outlet and automatic heat control to maintain this temperature over almost the entire load range. This boiler is of the dry bottom type instead of a slag tap because (1) it gives freedom in the selection of coals to be burned, where as a slag tap furnace would require coals having a relatively low fusion temperature ash; (2) the relative low steaming rate at night and weekends would be a condition somewhat unfavorable to a slag tap furnace; (3) the dry bottom type could be carried back if desired for the other two 400-lb. boilers if ever converted to pulverized fuel burning more advantageously than a slag tap furnace.



Automatic polarity control equipment for precipitator

The fact that the generating sta-

tion is located only ½ mile from the center of the city necessitated the installation of some sort of apparatus for removing the fly ash from the flue gases. Four types of eliminators were considered: (1) Wet eliminator, depending upon water films; (2) filter eliminators, depending upon dust screens; (3) multicyclones, and (4) electrostatic eliminators.

The first type mentioned, or the wet eliminator, has high maintenance costs, due in large part to the combining of sulphur vapors and water, forming sulphurous acid, which makes further handling a very expensive proposition as all pipe lines, pumps, etc., have to be made immune to this acid. The second type, or filter eliminator, requires considerable expense in maintenance of filter screens, is not suitable for high temperatures, requires a large amount of space and has high draft losses. The third type, or multicyclone, requires a considerable amount of space and has high draft losses.

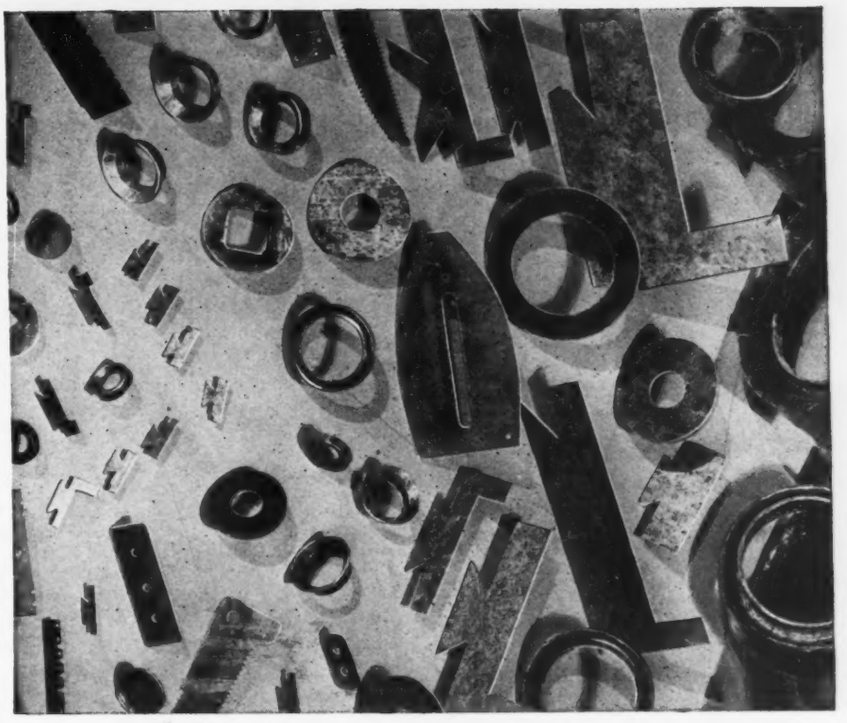
Electrostatic type chosen

These three types were eliminated from further consideration and the choice remained between the Buell type of large cyclone with secondary cone or the Cottrell electrostatic precipitator. Finally the Cottrell was purchased because of its higher efficiency (90 per cent plus 70 to 75 per cent), more dependable performance and because of the fact that this type would be more suitable for installation on the other two 400-lb. boilers in the event that they were changed over to pulverized fuel, and also because of the lower draft loss, which is important, because if these two 400-lb. boilers were changed over to pulverized fuel the same fan equipment would be used and increased draft loss would decrease the steam output.

For fly ash removal there are three types of electrical precipitators, the concrete plate type, vertical flow type and rod curtain type.

Concrete plate type is used on larger installations for horizontal flow. This type consists of the usual shell and has collecting electrodes of light-weight reinforced concrete 2 in. thick and small rods (No. 12) for discharge electrodes.

Vertical flow type is used where the flue installation is such that this type can easily be adapted without making extensive flue changes or



MICABOND

the only insulation for some . . . the best insulation for many purposes

Micabond combines the good qualities of raw mica with adaptability. It is mica in its most usable form — insulation that should be specified wherever maximum dielectric strength is needed in equipment subject to high operating temperatures.

Let us help you select Micabond in correct grade, form and strength for your requirements. Perhaps it might be economical to have us supply your fabricated parts, ready for assembly, a service some Micabond users find most advantageous. Ask for details.

CONTINENTAL-DIAMOND FIBRE COMPANY
NEWARK, DELAWARE
Represented in Canada by
DIAMOND STATE FIBRE CO. of Canada, Ltd., Toronto

MOLDING PLATE **HEATER PLATE**
SEGMENT PLATE **FLEXIBLE SHEETS**
TAPE-TUBING

FABRICATED PARTS SUCH AS "V" RINGS, SEGMENTS AND WASHERS

"NOTHING GETS THROUGH ME"

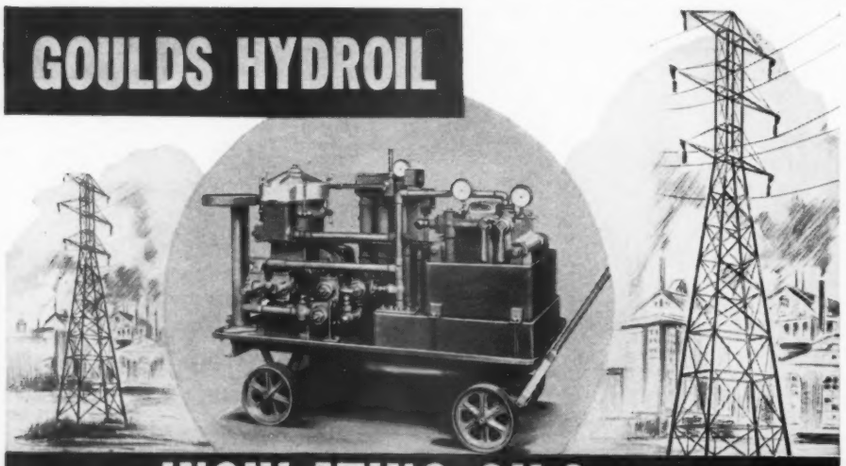
This tape is made of the highest grade materials for complete protection of electrical splices and joints. It keeps its life. Handles quickly and easily at average air temperature.

RUBBER TAPE AMAZON-VICTOR-

Distributed by GraybaR

OFFICES IN 85 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BLDG., NEW YORK

GOULDS HYDROIL



CLEANS INSULATING OILS AT LOW COST

A shutdown due to failure of a transformer, switch or circuit breaker caused by impurities in insulating oils may have damaging and far reaching effects. With a Goulds Hydroil Insulating Oil Purifier, you don't have to worry any more about sludge, moisture, and carbon contaminating insulating oil with the resulting danger of costly interruption.

Goulds Hydroil Insulating Oil Purifiers maintain the dielectric strength of these oils at low cost.

Leading power companies have found that Gould's Hydroil Purifiers protect and help maintain electrical service.

They are designed for permanent installation or portable use. Sizes are available to meet every requirement.

Goulds engineering service is yours to draw upon. Write today for complete information on how to guard equipment and service with Goulds Hydroil Purifiers.

GOULDS PUMPS Inc.

SENECA FALLS N.Y.

ATLANTA, BOSTON, CHICAGO, HOUSTON, NEW YORK, PHILADELPHIA, PITTSBURGH, TULSA, Representatives in all Principal Cities

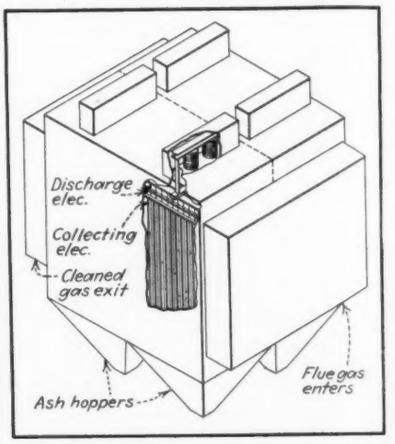
8280

with stoker-fired boilers. It consists of the steel shell containing hollow steel plates for collecting electrodes. These plates have slots like louvers opening upward so that the collecting dust falls through the slots and into the hollow space, then into a suitable hopper below.

Details of Lynn precipitator

The rod curtain type is installed at Lynn. This precipitator is known as the horizontal flow, rod curtain type, consisting of two units each of nine ducts, and is the first of this type to be installed in New England for fly ash precipitation.

The precipitator shell, as shown in the accompanying illustration, is almost cubical, having dimensions of 19 ft. x 18 ft. x 20 ft. high.



Precipitator shell arrangement

The collecting electrodes, which are ½-in. rods, are fastened top and bottom to form a grid or curtain. These collecting electrodes are about 6 in. on centers and about 10 in. between grids. These grids are all connected together and grounded to the housing. Then the high-tension cable is connected to the framework supported by two large insulators. From this framework are suspended the discharge electrodes, which are iron wire of 0.109 in. diameter, and attached to the ends of these wires are weights to prevent any motion.

As may be seen in the illustration, the precipitator housing is divided into two sections by a partition running lengthwise to the flow of gas. One set of apparatus supplies current to one-half the precipitator, across the flow of gas, while the other set supplies current to the other half. This then splits the gases entering the precipitator, and if for any reason one of the machines should be shut down the gases are still cleaned, although not as efficiently as if the two machines are on at the same time, which is normal operation. This is, in effect, two precipitators in series.

Referring to the illustration showing a cross-section of the Lynn power house, it will be seen that the precipitator is located on the roof, with the hoppers extending through to the floor below or fan room. Operating the boiler at full load, or 205,000 lb. of steam per hour, gases leave

the furnace and enter two Ljungstrom preheaters at a temperature of about 680 deg. F., leave the preheater at about 355 deg. F., are drawn through the precipitator by the induced-draft fan, having a section of 10½ in. of water, equivalent to 0.38 lb. per square inch, and then the cleaned gases are discharged into the stack. The material which has been precipitated is allowed to build up on the collecting electrodes until it falls down into the hoppers due to its own weight. There is a system of automatic rappers which consists of a series of solenoid-operated hammers which will at intervals rap the collecting electrode grids, thus causing the precipitated particles to fall into the hoppers, but we have found that each time those hammers are operated some of the fly ash, descending in a mass to the hoppers, will be carried through the precipitator, resulting in a cloud of smoke, therefore we do not use the rapping device.

There are four hoppers under the precipitator which receive the fly ash. From these hoppers the ash is carried through 3-in. pipe by means of a vacuum transport system to an ash storage tank (40 tons capacity) located outside the building. Also ash from the last pass of the boiler falls into four hoppers at the rear of the boiler and is carried through the same pipe to the ash storage tank. The vacuum for this transport is obtained by means of a water jet, using salt water pumped from our intake tunnel.

Wetting the fly ash

Naturally some of the ash falls down to the bottom of the furnace. This furnace ash is sluiced out with salt water by means of a Hydro-jet system, then pumped into another tank of 20 tons capacity, where the excess water is drained off. These two tanks are dumped into trucks and the ash carted away for disposal. This dry fly ash is nearly impossible to handle, so it is mixed with water, forming a paste, which can then be trucked and dumped without creating a nuisance.

This precipitator was designed to remove at least 90 per cent of the suspended matter when the volume was not greater than 95,600 cu.ft. per minute and at a temperature of 355 deg. F. The particles are very small,

THE "PICK OF THE PINES"
MAKE POLES FOR YOU
Southern pines that meet the strictest standards as to strength and straightness are used for our poles. Full length pressure treatment with creosote preserves the strength for decades of trouble-free, maintenance-free service.
The Wood Preserving Corporation maintains assorted stocks of poles at all times for immediate treatment and shipment. The pressure-treating plants are located advantageously for quick delivery to point of use. On your next requirements, write for a quotation.
THE WOOD PRESERVING CORPORATION
PITTSBURGH, PA.
AYER & LORD DIVISION, CHICAGO, ILL. CENTURY DIVISION, PITTSBURGH, PA.
Subsidiaries: Carolina Wood Preserving Co., Charleston, S. C. National Lumber & Creosoting Co., Texarkana, Ark.-Tex.
Sales Offices: Baltimore, Md., Charleston, S. C., Chicago, Ill., Columbia Park, O., Denver, Colo., Houston, Tex., Kansas City, Mo., Marietta, Ohio, Memphis, Tenn., Montgomery, Ala., Nashua, N. H., Newport, Del., New York, N. Y., Philadelphia, Pa., Pittsburgh, Pa., Reed City, Mich., St. Louis, Mo., Superior, Wis., Texarkana, Ark.-Tex.
a KOPPERS subsidiary

Go 'round the world in search of
GOOD INSULATORS
or just get in touch with
VICTOR
INSULATORS, INC.
VICTOR, N. Y.

V

ASSURE . . .
UNIFORM-COMPACT
SPLICES ON THE UNDERGROUND CABLE

These cable connectors are accurate to size and have a guaranteed conductivity of 98% or better. Split the entire length and tin coated they facilitate the flow of the hot solder and assure ease of soldering and evenness of distribution. Made in a size range from 12 B & S to 2,500,000 C.M. Write today for prices and samples.

THE NATIONAL
TELEPHONE SUPPLY CO.
5100 Superior Ave. **Cleveland, Ohio**

82 per cent passing through a 325-mesh screen.

When operating under favorable conditions of good combustion and the proper type of coal the precipitated fly ash contains about 20 per cent combustible by weight. This percentage can very readily rise to 75 per cent, however, when a poorer type of fuel is burned or combustion conditions are abnormal.

After a year the company feels very much satisfied that this installation is operating as was expected and at a very nominal cost of about 400 kw.-hr. per day.

•

Proposed Patent Measures Opposed by Manufacturers

Harry R. Bradley, vice president of Allen-Bradley Company, last week opposed the proposed compulsory patent licensing bill of Representative McFarlane which would reduce the patentee's control over his patent from seventeen to three years. For the following fourteen years licenses to use the patent could be issued to any financially responsible firm by a federal commissioner of patents on royalty terms approved by him. Mr. Bradley testified that possession of good patents had twice saved him from bankruptcy and that reduction of the present seventeen-year period of exclusive patent control would hurt small patent owners.

Arthur Simon, Cutler-Hammer, Inc., electrical engineer, protested a similar measure proposed by Representative O'Malley, which would supply free counsel for the defense and prosecution of the rights of indigent patentees. According to Mr. Simon, the bill would encourage large firms to halt research and "enrich themselves by the fruits of the labor of the independent inventor."

•

Building Industry Exhibit Includes Utility Services

The Exhibition Hall of the Building Industries Section in the Merchandise Mart, Chicago, will have its official opening on April 11. This development will afford prospective home builders, home modernizers, architects and contractors of the entire Middle West a comprehensive coverage of every branch of the home building field. Included in the exhibits will be the Illuminating Engineering Society's demonstration of the Better Light-Better Sight idea and displays of the four services rendered by public utility companies, electricity, gas, water and telephone.

Control of Radio Noise Can Enhance Appliance Load

[*Continued from page 46*]

voltages provides an impedance of 600 ohms from the supply line to ground and has the voltage divider circuit required for measurement of high noise voltages. Aside from the change in coupler, the apparatus and method employed in measuring asymmetrical voltage does not differ from that employed in measurement of symmetrical voltage. Curve C-C in Fig. 4 shows the variation in

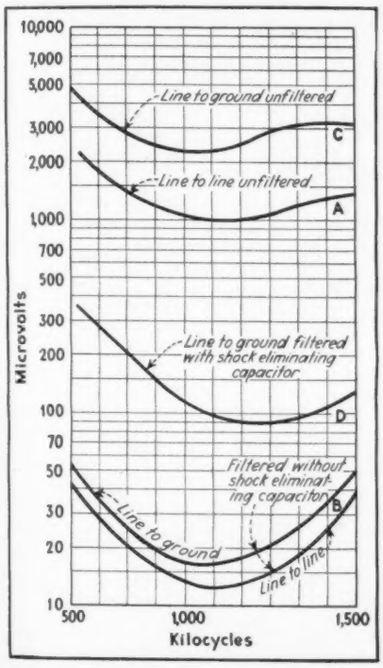


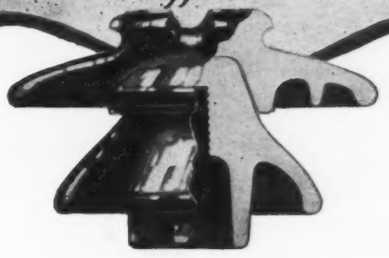
Fig. 4—Radio noise output of hand type vacuum cleaner

a symmetrical noise voltage developed by a small appliance.

The probable effect of appliance noise voltage on radio receiver operation is determined by correlating the standard noise measurements with the other factors mentioned earlier in this article. Susceptibility of the receiver and antenna to noise pick-up, the radio frequency characteristics of the building wiring and the relationship between the wiring and the receiver are variables whose effect may be expressed as per cent coupling factor. For ordinary purposes, under average conditions, it is safe to assume a coupling factor of 30 per cent. The strength of available radio signal fields may be determined from the broadcasting stations in the territory. The problem then is to find what radio noise voltage developed by an electrical

THOMAS INSULATORS

DIFFERENCE
Where Difference Counts



Thomas No. 2124
Rating 45 Kv.

Dry Flashover 125 Kv.
Wet Flashover 85 Kv.

Leakage Distance 21 inches.
Mechanical Strength 3000 lbs.

The question is often asked why one insulator of the same general design, same number of shells, same nominal rating, and in all respects practically identical with another proves to be far superior in service . . . . . .

The answer is figuratively simple . . . many differences exist where difference counts, which are not always visible to the eye. Thomas designers have not only met the demands of trade specifications but have created designs that possess intrinsic plus values . . . thus netting the user Absolute Reliability and Added Life to his Insulator Equipment.

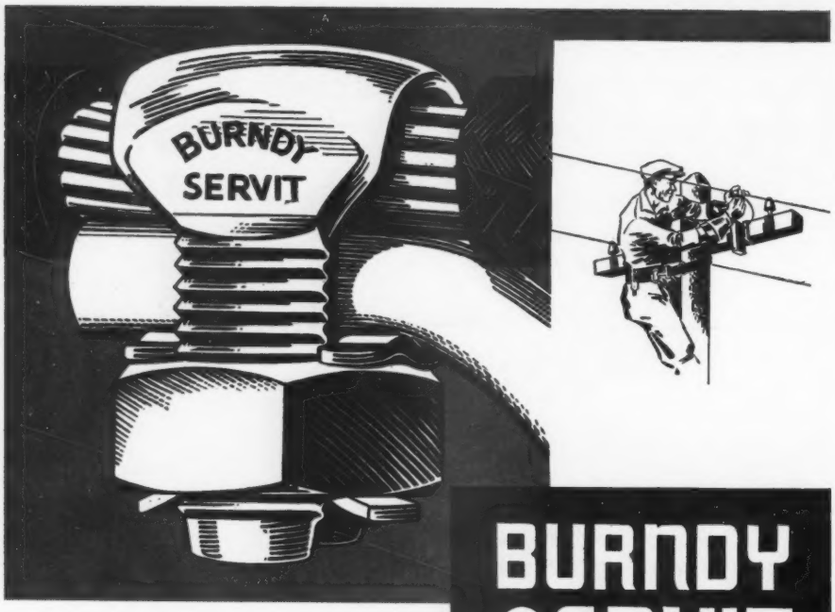
One outstanding example is Thomas No. 2124. This rugged two piece design embodies characteristics which enable it to resist to a great degree, rough handling during construction, sudden extreme temperature changes, the destructive effect of heavy power arcs, and malicious abuse on the line. Performance Records prove there is a *difference where difference counts.*

Specify Thomas No. 2124 for your 33 Kv. lines, they'll cost you less in the long run.

"OUR 65th YEAR"

PORCELAIN INSULATOR MANUFACTURERS EXCLUSIVELY

THE R. THOMAS & SONS COMPANY
ENGINEERS - MANUFACTURERS - DESIGNERS
Established 1873
LISBON, OHIO, U. S. A.
OFFICES: - NEW YORK - BOSTON - CHICAGO
GRAYBAR ELECTRIC CO., INC., Agents
Incorporated 1892



• Specify the Servit... the connector with *forged-in* strength!

BURNDY Engineering Co., Inc. 459 E. 133d St. N.Y.

BURNDY SERVIT

Motor | operation data maintenance hints trouble location and remedy

This revision of Terrell Croft's well-known manual offers you a practical, step-by-step coverage of the operation, construction and characteristics of a-c and d-c generators and motors.

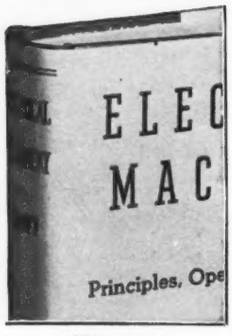
Now Ready—New 4th Edition

Terrell Croft's

Electrical Machinery

Revised by GEORGE H. HALL

Special attention is given in this book to the installation and operation of motors and generators; trouble location and the correction of troubles; and proper selection of specific motors for specific purposes. Terminology and practice have been brought into conformity with the standardizations of the National Electrical Manufacturers Association and with the 1937 regulations of the National Electrical Code.



392 pages, illustrated, $3.00

Special Features:

—emphasis on new types of motors and improvements on older types

—new photographs to illustrate up-to-date designs

—new material on the design and application of multi-speed motors and mercury-arc power rectifiers

10 DAYS' EXAMINATION ON APPROVAL—SEND THIS COUPON
McGRAW-HILL BOOK CO., INC., 330 W. 42nd St., N. Y. C.

Send me Croft—Electrical Machinery for 10 days' examination on approval. In 10 days I will send $3.00, plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by remittance.)

Name .....

Address .....City and State .....

Position .....Company .....W. 4-9-38

(Books sent on approval in U. S. and Canada only.)

appliance will cause objectionable noise in receivers tuned to stations normally heard. It has been tentatively agreed by radio engineers that a signal-to-noise ratio of 40 decibels or 100 to 1 across the antenna and ground terminals of the receiver is required for unimpaired radio reception. Thus any device that creates noise voltage of sufficient amplitude to decrease this ratio may destroy radio load.

The signal-to-noise ratio may be expressed by the formula:

$$R = \frac{E_s \times h}{E_n \times c}$$

when

R = signal to noise ratio
E_s = radio signal strength in microvolts per meter
h = effective height of the receiving antenna
c = coupling factor
E_n = measured radio noise voltage developed by appliance.

Assuming an average radio receiver installation with a 30 per cent noise coupling factor, an effective antenna height of three meters, a 550-kilocycle signal of 1,000 microvolts per meter and the small appliance whose noise characteristics are shown in curves A-A and C-C of Fig. 4, the signal-to-noise ratio is $\frac{1,000 \times 3}{4,000 \times 0.30} =$ 2.5. Obviously, such a signal-to-noise ratio will provide extremely poor reception if it does not make reception a practical impossibility.

For the condition just described, the noise voltage developed by the appliance must be reduced from 4,000 microvolts to 100 microvolts to provide the desired 100 to 1 signal-to-noise ratio. This attenuation is easily obtained by application of a correctly designed capacitive type Filterette. Curve B-B in Fig. 4 shows the line-to-line or line-to-ground voltage output of the appliance after application of the capacitive Filterette consisting of two 0.04-mfd. capacitors connected across the power supply line with their mid-tap connected to the appliance frame.

Because the amount of alternating current that might flow through the filtering capacitors to ground at 115 volts, 60 cycles, exceeds the 0.2 milliampere limit that has been established for freedom from unpleasant sensation of electric shock, it is obvious that the design of the interference eliminating filter must be modified so as to limit this current flow. Curve D-D in Fig. 4 shows the noise voltage output of the appliance after introduction of a capacitance of 0.006 mfd. between the appliance frame and the center tap of the capacitors connected in series across the line. It will be noted that this modification in Filterette design makes it impossible to attain the desired 100 to 1 signal-to-noise ratio, but does permit the radio noise output of the appliance to be so re-

duced that for the condition which has been assumed the signal-to-noise ratio will be 30 to 1.

From the data included in this article it is evident that quantitative measurement of radio interference is beneficial to both utilities and electrical appliance manufacturers and that the availability of standard noise-measuring equipment that permits tests to be duplicated in any location or at any time provides an engineering basis for specifications relating to the radio interference that may be permitted as a result of the operation of an electrical appliance.

•

Air-Conditioning Orders Off 10 per Cent in January

Orders booked for air-conditioning systems and equipment, during January, 1938, as reported by 125 manufacturers, amounted to $2,655,874, as compared with $2,948,246 during December, 1937, and with $4,876,322 during January, 1937, according to the U. S. Department of Commerce.

For the same periods, orders booked by the air-conditioning group of manufacturers totaled $1,257,908, as against $1,040,025 and $2,637,948. Despite this over-all decrease, orders booked for industrial central-station systems were $167,222, against $7,232 and $73,412. Orders booked by the fan group were $749,222, as against $869,680 and $1,365,128; orders booked by the unit heater group totaled $648,744, compared with $1,038,541 and $873,246.

•

200,000 G. E. Stockholders

For the first time in the history of the General Electric Company the number of its stockholders has passed the 200,000 mark. On December 31, 1937, there were 201,219, an increase of more than 11,000 over a year ago, and 162,370 more than the total ten years ago. Since 1917, or in the past twenty years, the number has increased more than fifteen times.

•

Washer Shipments Increase

Household washers shipped in February showed an upturn from January, totaling 94,734 compared to 72,611, or an increase of 30.6 per cent, according to industry figures reported by J. R. Bohnen, executive secretary of the American Washing Machine Manufacturers' Association. February shipments were 36.6 per cent below those of the same month last year.

DIRT—DEVILTRY—DIVERSION

(The Three "D's")

Your Electric Meters are normally honest, accurate assets

Any or all of the "Three D's" will turn your electric meters into tricky, inaccurate liabilities.

Superior Overall Meter Enclosures will protect your meters from Dirt, Deviltry and Diversion.

Write for Bulletins 378 and 379

Superior Switchboard & Devices Company

CANTON, OHIO

*Been at it Since 1920

SUPERIOR

REG. U. S. PAT. OFF.

An
EXPERIENCED
AND QUICKLY AVAILABLE
CONSTRUCTION
ORGANIZATION

TRANSMISSION LINES
SUBSTATIONS
RURAL LINES
OVERHEAD-UNDERGROUND

*Our twenty-five years of construction experience can be of value to you now in dependable and economical results even for the longest line extensions. Have one of our representatives call and discuss this service with you—let us submit an estimate on your next requirements.

The MILLER-BAXTER CO., Inc.
445 N. PENNSYLVANIA AVE.
INDIANAPOLIS, IND.

THE SAFE ANCHOR
FOR R.E.A. CONSTRUCTION!

For long life and economy in annual maintenance costs, Everstick Anchors are first choice in rural electrification construction. Their safety and dependability have been proven on millions of miles of electric lines.

ANCHORS FOR EVERY PURPOSE

The complete line of Everstick Anchors offers three expanding types in a complete range of sizes and holding capacities. Also rigid type Cone Anchors in all sizes. Made of malleable iron with its properties of strength, elasticity and rust resistance. Write for new bulletin "Everstick For Rural Electrification."

★

THE EVERSTICK ANCHOR CO. Fairfield, Iowa

Selling Ranges, Water Heaters in National Gas Territory

[*Continued from page 51*]

tory on all types of electric kitchen equipment.

We soon found that we could not create customer faith in electric ranges and water heaters if our display rooms were not attractive. As a result, six of our nine stores have been remodeled and brought up to date. Two more are budgeted for remodeling this year. Model kitchens have been installed in three of our four larger stores. The fourth model kitchen will be installed this year. These kitchens are proving to be one of our best sales tools for interesting the customer in electric cookery.

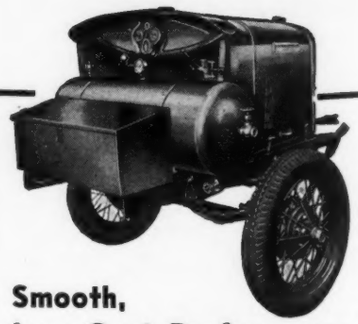
As a result of our three years' experience we are convinced that electric cookery can be sold in any territory regardless of competing gas rates. We saw conclusive proof of this statement when we purchased the electric distribution system of Cottonwood Falls, Kan., consisting of 524 residential meters. Only two electric ranges were in use in the territory, both users being the former owners of the company. A flat gas rate of 50 cents is available. As a result of our introduction of lower promotional rates and a well-organized program thirteen electric ranges and one water heater were sold during the first two months.

The promotion of electric water heater sales we find a bit more difficult than ranges. In the first place only about 15 per cent of our customers have automatic gas systems, consequently this necessitates the selling of automatic hot water service. Since most of the better homes in our territory have basements our electric water heater story is not as effective as our range story.

•

Westinghouse Gets Another Contract from Hagerstown

Westinghouse Electric & Manufacturing Company has secured a contract for condenser and auxiliary equipment at $33,699 for installation in the municipal power plant at Hagerstown, Md. This follows a recent award to Westinghouse by the city for a 5,000-kw. turbo-generator unit and accessories at $112,000, to be installed in the station, where an expansion program is under way. Wood & Kirkpatrick, Philadelphia, Pa., are consulting engineers.



Smooth,
Low Cost Performance
The SMITH
AIR COMPRESSOR

• Made from FORD PARTS

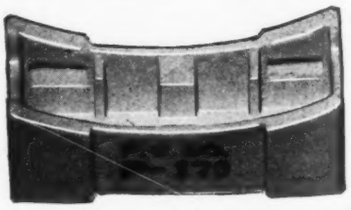
Used everywhere by Utility Companies for drilling rock in pole holes and pipe line ditches, breaking concrete, macadam, and boulders, cutting asphalt, tamping backfill, drilling holes for rock anchors, and testing pipe lines. May be towed behind trucks and service cars at high speed. Easily moved about on the job by one man. Over 60 cubic feet a minute capacity. Pressure up to 175 lbs. a square inch. Head equipped with high speed compressor valves; automatic unloading and idling. Uses only one gallon of gasoline per hour. LOW IN COST—ECONOMICAL TO USE.

With a Ford Motor and shop facilities you can assemble your own compressor. We will furnish a Smith Compressor Head and Accessories with instructions for mounting.

Address Inquiries to Desk O

GORDON SMITH & CO., Inc.
BOWLING GREEN, KY.

GUARD
AGAINST
CURRENT
DIVERSION
with
STAR
METER SEAL



Saves many thousands of dollars annually by elimination of tampering and theft of current. Seals all types CS meters effectively and permanently. Cannot be removed without destroying or mutilating. SEND FOR SAMPLE.

The STAR
PORCELAIN COMPANY
TRENTON NEW JERSEY

Carter Field

[*Continued from page 58*]

construction. The program is being financed by a $15,000,000 federal loan and grant from the Public Works Administration and by direct appropriations of approximately $10,000,000 from the Bureau of Reclamation from federal relief funds."

Texas is a big state, so maybe Jesse H. Jones, who comes from Houston, did not think about this Fort Worth thing when he was convinced by the President, within a week of the issuance of this statement, that the White House was now persuaded relief was "only a shot in the arm," and that to provide employment it was necessary to encourage private business to expand, via government loans if necessary!

Vacation Publicity Plan

Public utility companies may find a suggestion for community development in the co-operative activity carried on by a group of New England and Florida companies. The New England Gas & Electric Association is boosting Florida as a winter vacation spot, and, as a return courtesy, Florida Power Corporation and Florida Public Service Company offer their customers assistance in planning summer vacation trips to New England.

•

$4,000,000 for New Plant

The Government Railways Department, Melbourne, Victoria, Australia, will soon begin purchases of generating and other equipment for its new generating plant at Newport. The project will be carried out over a period of months and will represent an estimated investment reported in excess of $4,000,000.

•

Electric Sales in Illinois

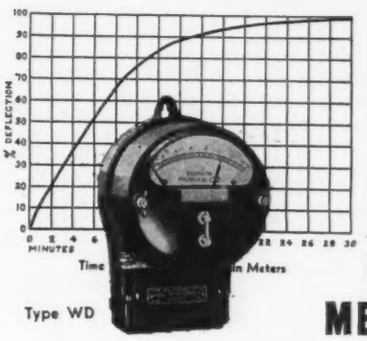
Total sales of electricity to ultimate consumers in Illinois reported by eleven large electric utilities in January, 1938, were 597,434,867 kw.-hr., representing a decrease of 4.1 per cent under January, 1937, and of 1.8 per cent under December, 1937.

•

British Output Increases

Official returns submitted to the British Electricity Commission show that 2,382,000,000 units of electricity were generated in Great Britain during January, compared with the revised figure of 2,176,000,000 units in January, 1937, representing an increase of 9.5%.

LINCOLN DEMAND METERS



Time Response of Lincoln Meters

Independent OF TIMING MECHANISMS

The above curve shows the time required to reach any percent of a steady load maintained for any given length of time. This time lag is inherent in the construction of Lincoln Meters and is due to the heat storage capacity of the material used.

SEND FOR YOUR COPY OF CATALOG TO:

LINCOLN METER COMPANY
SPRINGFIELD, ILLINOIS

AMELECTRIC

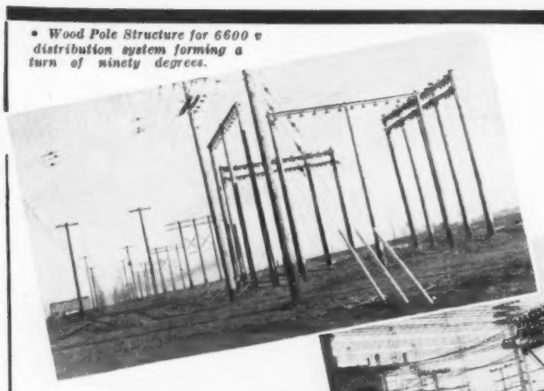
WIRES AND CABLES

POWER CABLE
PAPER INSULATED
VARNISHED CAMBRIC INSULATED
TELEPHONE CABLE
BARE COPPER WIRE AND CABLE
WEATHERPROOF WIRE AND CABLE
MAGNET WIRE
TROLLEY WIRE

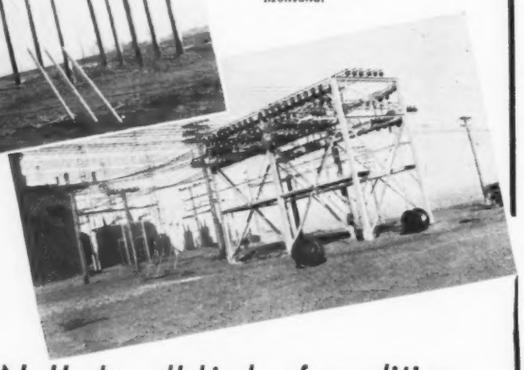
"QUALITY ABOVE SPECIFICATIONS"

KENNECOTT WIRE AND CABLE COMPANY
SUBSIDIARY OF KENNECOTT COPPER CORPORATION
PHILLIPSDALE, RHODE ISLAND
New York, 10 East 40th St. - Chicago, 140 South Dearborn St. - Cincinnati, Traction Bldg.

• *Wood Pole Structure for 6600 v distribution system forming a turn of ninety degrees.*



• *Steel Switching Tower erected at Fort Peck, Montana.*



EXPERTS
ON
NEW
CONSTRUCTION *Under all kinds of conditions*

A. S. SCHULMAN
ELECTRIC COMPANY
537 S. Dearborn Street
CHICAGO, ILL.
FOUNDED 1890

● The Schulman organization of erection specialists has had more than 50 years of experience in power line rehabilitation and construction projects. Trained crews and modern equipment for low-cost construction, in the quickest time, are immediately available. Let us submit quotations and consult with you on your next requirements.

STEEL TOWER • • • WOOD POLE LINE CONSTRUCTION
SWITCHING STRUCTURES • SUBSTATIONS • POWER HOUSES

Acme Bias Tapes are

Every run of tape is thoroughly tested **CONSTANTLY TESTED** —for *tensile strength*, as above, for elongation (stretch) and for dielectric strength. These tests are made according to A.S.T.M. standards, but must exceed them by a wide margin . . . . a point to remember when specifying insulations.

The Acme Wire Co., New Haven, Conn.

ACME WIRE PRODUCTS

VARNISHED INSULATIONS — MAGNET WIRE COILS — CAPACITORS

RELIABILITY

Electrical and Mechanical

J-D PORCELAIN INSULATORS

J-D Porcelain Insulators—Suspension Switch and one-piece, high-voltage pin types—combine high mechanical and electrical strength with reliability. Also Strain Insulators, Bushings, Special Shapes and a complete line of Insulator Hardware.

Lines all over the world testify to J-D QUALITY.

If you are a J-D user, CONSULT THE RECORD—if not, CONSULT US.

THE JEFFERY-DEWITT INSULATOR CO.

KENOVA - - - - - - - - W. VA.

Rural Allotments; Contracts Awarded

The following allotments have recently been announced by the Rural Electrification Administration:

ILLINOIS—Shelby County Rural Electrification Co-operative, $176,130, 169 miles of line, 646 customers in Shelby, Macon and Moultier counties. Source of power will be Central Illinois Public Service Company.

OHIO—Western Farm Bureau Electric Co-operative, Inc., $140,000, 129 miles of line, 398 customers in Mercer, Van Wert, Allen and Auglaize counties.

VIRGINIA—Co-operative being formed, 31 Mecklenburg, $129,000, 136 miles of line, 369 customers in Mecklenburg and Charlotte counties. Source of power will be Virginia Public Service Company.

GEORGIA—Lamar Electric Membership Corporation, $127,000, 144 miles of line, 673 customers in Lamar, Pike, Monroe and Upson counties. Source of power will be the City of Barnesville.

MISSOURI—Scott-New Madrid-Mississippi Co-operative, $157,000, 171 miles of line, 518 customers and an additional 142 prospective customers in Scott, New Madrid and Mississippi counties. Source of power will be Sikeston municipal plant.

OKLAHOMA—Consumers Rural Electric Company, $212,000, 209 miles of line, 470 customers and an additional 313 prospective customers in Kingfisher, Major, Blaine, Canadian and Dewey counties. Sources of power will be Fairview municipal plant and Oklahoma Gas & Electric Company. Inter-State Co-operative Electric and Power Company, $135,000, 125 miles of line. 331 customers in Pontotoc, Hughes and Coal counties.

SOUTH CAROLINA—Aiken County Rural Electrification Association, $134,000, 148 miles of line, 429 customers and an additional 258 prospective customers in Aiken and Orangeburg counties.

FLORIDA—Clay Electric Co-operative Association, Inc., $163,000, 143 miles of line, 390 customers in Alachua, Bradford, Clay, Putnam and Union counties. Sumter Electric Co-operative Association, Inc., $166,000, 179 miles of line, 418 customers in Sumter, Lake, Marion and Hernando counties.

Construction contracts

Morgan County Rural Electric Association, Fort Morgan, Colo., has awarded a contract to Driscoll Construction Company, Pueblo, Colo., for building first section of this project, consisting of 165 miles of line, to serve 392 customers, including a substation. Low bid $166,625.

Central Valley Electric Membership Corporation, Artesia, N. M., contract to J. E. Morgan & Sons, El Paso, Tex., for building distribution lines of entire project, consisting of 80.6 miles of line. Low bid $111,774.

Carroll Electric Co-operative Corporation, Berryville, Ark., has awarded contract to A. A. Electric Company, Cicero, Ill., for building the distribution lines of entire project, consisting of 199.5 miles. Low bid $138,971.

Central Pennsylvania Rural Electric Co-operative Company, Parkers Landing, Pa., has awarded contract to Miller-Baxter, Inc., Indianapolis, Ind., for building entire project, consisting of 432 miles of line. Low bid $410,560.

ROME-CABLE
ROME, N.Y.

To buyers of rods, wires, and cables, we offer a line of products which meet exacting specifications

We will be pleased to quote on your requirements for

HOT ROLLED COPPER RODS
BARE & TINNED COPPER WIRE
(In rounds, flats & squares)
BARE & TINNED STRAND
U. R. C. WEATHER PROOF WIRE
MAGNET WIRE
FLEXIBLE CORDS
RUBBER COVERED WIRES & CABLES
LEAD COVERED CABLES

ROME CABLE
CORPORATION
Mills and executive offices
330-400 Ridge Street
ROME, N. Y.

SALES OFFICES:
New York Chicago
Cleveland Pittsburgh Boston
Richmond Philadelphia Dallas
Los Angeles

Bowie-Cass Electric Co-operative, Inc., Douglassville, Tex., has awarded contract to Glassel Construction Company, Shreveport, La., for building first section of the project, consisting of 202 miles of line. Low bid $118,284.

Magic Valley Electric Co-operative, Inc., Mercedes, Tex., has awarded a contract to the P. E. Workman Company, Dallas, Tex., for building the first section of the project, consisting of 235 miles of line, Low bid $144,900.

•

Recent Legislation

Among the new bills which have been introduced in the legislatures of the various states are the following:

MISSISSIPPI—Senate, with only one dissenting vote, has passed a House bill exempting TVA and REA power lines and enterprises operated without profit from all property, privilege and sales taxes. Minor clarifying amendments were added to the House bill and must be ratified by the House, but no opposition is expected. By a vote of 34 to 1 a bill allowing county and city governments of the state to prescribe maximum utility rates was approved recently by the Senate. Under amendment to original measure, the utility companies under investigation for rate charges would be forced to share half of the expenses of the investigation. Both sides would be allowed to appeal grievances to chancery or circuit court and could be taken as high as the supreme court. Mississippi has had no public utilities or public service commission, but a bill has just been passed establishing a commission in the state.

NEW JERSEY—Bills stripping local assessors of power over utilities and transferring it to the State Tax Commissioner became law when the Senate followed the action of the Assembly and passed the bills over Governor Moore's vetoes. The new laws alter the method of apportioning utility gross receipts and franchise taxes and let the commissioner use his judgment as to how these taxes shall be apportioned among the municipalities.

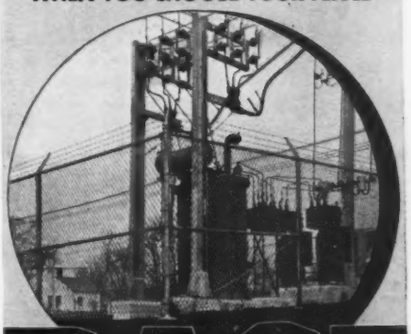
VIRGINIA—An act of the 1938 Assembly gives the State Corporation Commission broad power over utility corporation financial transactions, empowering the commission to prohibit the payment of a common stock dividend by a utility corporation if it deems the payment at variance with the public good. H. Lester Hooker, chairman of the commission, said the bill was aimed at holding companies which might control Virginia corporations.

•

TVA Contracts Approved

Power contracts with three cities, Columbus and Starkville, Miss., and Lenoir City, Tenn., have been approved by the board of directors, John B. Blandford, Jr., general manager of TVA, has announced. Lenoir City has two electric systems at the present time—a municipally owned Diesel-generating plant and distribution system and that of the Tennessee Electric Power Company. Columbus and Starkville are now served by the Mississippi Power Company.

CAUTION
CHOOSE THE RIGHT METAL
WHEN YOU CHOOSE YOUR FENCE



PAGE FENCE

Be warned: No one fence metal is resistant to all the destructive air conditions encountered in various localities. Such conditions include salt spray, alkali, acid or chemical fumes — often carried long distances in the air from neighboring oceans, mineral soils, chemical plants or factories.

5 Superior Fence Metals Meet All Atmospheric Conditions

To meet these various destructive air conditions PAGE FENCE is supplied in 5 master metals—Page P-12 Copper-bearing Steel, Page-Armco Ingot Iron, Page-Alcoa Aluminum, Page-Allegheny Stainless Steel and Page genuine Wrought Iron picket fence. The metal best suited to your locality and purpose is impartially recommended, by PAGE fence experts.

FENCE FACTS FREE

Mail the coupon. It will bring you illustrated booklet "Fence Facts" and refer you to nearest of 92 completely responsible Page Fence Distributors located throughout the United States for free consultation, expert fencing service and erection by trained crew.

Page Fence is a product of the Page Steel & Wire Division of American Chain & Cable Company, Inc.

Fence facts

PAGE FENCE ASSOCIATION

Dept. EW4, Bridgeport, Connecticut
Please mail me, without obligation, new Free Booklet, "Fence Facts," and name of nearest associated Page Fence Distributor.

Name.....
Address.....
City.....*State*.....

AMERICA'S FIRST WIRE FENCE • SINCE 1883

BROOKS
Adjustable
SAFETY CLIMBER

HERE IS ONE CLIMBER
Made to Fit *YOU*

The Brooks Adjustable Climber Gives You:

- New features to insure greater safety
- Low Cost Replacement Parts
- The Brooks Climber is sturdy and durable—will withstand wear and severe strain.

Investigate these features. Write today for full information.

Manufactured by
MELLING FORGING CO.
1403 Case Street
LANSING, MICHIGAN

Electric Truck Shipments Decline 40% From Year Ago

Domestic shipments of electric industrial trucks and tractors during the first two months of 1938, as reported by ten manufacturers representing the entire industry, totaled 168, as compared with 277 for the first two months last year, a drop of nearly 40 per cent, according to the Department of Commerce. For the same periods new orders were 117, against 276, a decrease of about 58 per cent.

Domestic shipments during February, 1938, were 79, against 89 in January, 1938, and 131 in February last year. For the same periods new orders were 56, as compared with 61 and 154.

•

Dividend Reduction Likely

Lewis H. Brown, president of Johns-Manville Corporation, told the recent annual meeting that while he hesitated to make predictions, he thought the dividend will be reduced this year in line with present economic conditions. Earnings for the first quarter, Mr. Brown said, when compared with the similar period of 1937, will be disappointing and reflect the precipitous decline in general business and the change in trend of the construction industry. Sales of Manville in general, he said, are running about 25 per cent behind a year ago, and forward securements are about 30 per cent lower.

•

Changes Primary System

Northern Indiana Power Company is spending $73,120 in Huntington, Ind., to change its primary system from a two-wire 2,300-volt system to a four-wire, 4,100-volt distribution, according to William M. Large, local manager. The change will nearly double the capacity of the distribution system and improve voltage and service conditions.

Crapo
GALVANIZED PRODUCTS

Where strains and stresses are heaviest, where corrosion takes its greatest toll, *Crapo* Galvanized Steel Strand and Telephone Wire constantly are proving their outstanding superiority. The heavy, tenaciously bonded zinc coating, maximum tensile strength and correct ductility insure longer life and lower maintenance cost. Insist upon *Crapo* Galvanized Products for better performance under all conditions! Ask your Jobber or write direct!

INDIANA STEEL & WIRE CO.
MUNCIE, ✦ INDIANA

Crapo Galvanized Strand and Telephone Wire can be obtained readily in all standard grades and sizes.

G.C.A.
Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks

Send for Catalogue

We have been making safety tools for 20 years

The G. C. A. Manufacturing Co.
Pittsfield, Mass.

"ANVIL" BRAND BLOCKS

Linesmen find "Perfect" Metal Block gives best service.

Send for Catalog E.W. covering full line.

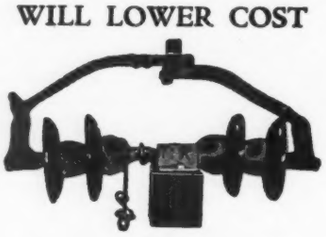
Western Block Co.
Lockport, N. Y.

NEW YORK CITY
74 Murray St.
CHICAGO
34 N. Clinton St.

LEACH LR RELAYS
SINCE 1920

Catalog on Request
LEACH RELAY COMPANY
5915 Avalon Boulevard, LOS ANGELES, CALIF.
15 E. 26th St., NEW YORK CITY

K-P-F
AIR BREAK SWITCHES WILL LOWER COST



K-P-F ELECTRIC CO.
855 Howard St., San Francisco

HIGH GRADE HARD PORCELAIN FOR Electrical Specialties
High and Low Voltages

IMPERIAL PORCELAIN WORKS
TRENTON, NEW JERSEY